



DEPT OF ENVIRONMENTAL QUALITY  
RECEIVED

NOV 27 2018

NORTHWEST REGION

November 20, 2018

Dan Hafley  
Oregon Department of Environmental Quality  
4350 NW Front Avenue  
Portland, OR 97210

Re: Response to Comments  
Original and Former Fire Training Facilities, Additional Investigation Work Plan Addendum  
Portland International Airport  
ECSI No. 3324  
1264-04

Dear Mr. Hafley:

This letter presents responses to comments that were issued by the Oregon Department of Environmental Quality (DEQ) on November 9, 2018 and the City of Portland (City) Water Bureau (PWB) on November 8, 2018 for the October 26, 2018 *Additional Investigation Work Plan Addendum, Original and Former Fire Training Facilities, Portland International Airport, (Work Plan)* which was prepared by Apex Companies, LLC (Apex) on behalf of the Port of Portland. Agency comments are presented in italics, followed by responses.

### **DEQ Comments**

*1. Both DEQ and the City of Portland (Water Bureau) have noted that proposed investigation does not include expanded investigation within the CRSA aquifer. Acknowledging that additional investigation will be necessary to determine the vertical and horizontal limits of contamination within the CRSA, we are comfortable delaying this work until wells are surveyed, an assessment of groundwater gradient has been completed, and a few rounds of (quarterly) contaminant analysis has been completed.*

Comment is noted.

*2. Section 1.2. We are in general agreement with the shallow groundwater monitoring well proposal, but suggest the following:*

*2a. Installation and monitoring of a well in the vicinity of B-G-GW, to provide better "areal" coverage for contaminant detections and water table elevations northeast of the historical training areas.*

Comment is noted. No additional monitoring wells are proposed at this time. The primary goal of the next phase of investigation is to delineate the extent of PFAS groundwater impacts, to collect data to confirm that off-site migration is not occurring, and to determine hydraulic gradient. The proposed monitoring wells will be installed, monthly gauging will be conducted, and quarterly monitoring will be performed to collect additional data in support of evaluating contaminant migration and hydraulic gradient. Additional wells may be installed following the next phase of investigation, if warranted.



2b. Well installation at or a short distance south/southwest of the B-5 location for contaminant and data.

Three well installations are proposed at locations to the west/southwest of the B-5 location. Following a year of the quarterly monitoring of these wells, additional wells may be installed if warranted. Figures 4 have been revised to show the proposed wells. One of the three well locations has been adjusted (northward) for better spacing, and was added to Figure 3. The well location has previously been obscured by the Figure 3 legend.

2c. A "perimeter" well south of B-Q-GW and equidistant between proposed wells south of the highest area. DEQ notes the distance between the two wells is approximately 1,320 feet, and the relatively poor of the NW-104 location where PFOA was detected at 31,320 ppt.

No additional wells are proposed at this time. Additional wells may be installed based on the results of the next phase of data collection.

2d. Given the detection of PFOA at 4,500 ppt at the B-5 location, it seems possible if not likely that PFOS/PFOA will be detected at one or both of the proposed well locations to the west. The purpose of the investigation effort is to delineate the "70 ppt perimeter" based on the EPA drinking water health advisory. This goal may not be achieved.

Comment is noted. Additional investigation may be conducted in the future as needed, based on the results of the next phase of investigation.

3. Section 2.3. Monthly water elevation measurements are included in the work plan as requested by DEQ. In their November 8 comments, FWS suggested use of downhole pressure transducers. We agree that these may have value in assessing groundwater gradient in existing CRSA wells. Please consider.

Comment is noted. For the next phase of data collection, monthly gauging will be conducted. Pressure transducers may be utilized for future phases of investigation. During monthly gauging activities, AER will also note the river stage from the nearest Columbia River gauging station (USGS 14144700, Vancouver, WA).

4. Section 3.0. Text in Section 3.1 indicates that a "modified version of EPA Method 537 is being used for contaminant analysis. Method 537 was developed and validated for the analysis of volatile organic compounds from either surface or groundwater sources, and was used to support public water system testing under UCMR 3. There does not appear to be a standardized methodology for modified 537 analyses, which might include "direct injection" or solid-phase extraction/isotope dilution (SPE-ID). Please identify specific laboratory protocols that will be used for PFAS analysis.

Comment is noted. Consistent with prior investigations, samples will be analyzed using the modified Method 537, which includes SPE-ID. This method has been verified by the laboratory using performance evaluation standards and provides lower recovery limits to aid with comparison to low screening levels. If warranted, the analytical method may be modified for future phases of investigation.

5. Section 3.0. Forthcoming analytical work at the Portland Air National Guard Facility (located within P2A) will include analysis for a broader suite of PFAS (24 versus 14), including so-called precursor compounds that can degrade (biotically or abiotically) to PFAS/PFOA. DEQ will consider whether this or other precursor analysis is necessary once the site monitoring network has been established.

Comment is noted.



6. Section 4.0. The proposed outline should include a section for presentation and discussion of stormwater and surface water data, in addition to groundwater.

The outline in Section 4.0 has been revised to include stormwater and surface water data presentation.

### **PWB Comments**

1. The three new Upper CRSA wells (DW-1, DW-2, DW-3) provide additional information that is helpful for understanding the nature and extent of PFAS in the CRSA. The vertical extent of PFAS in the CRSA and the horizontal extent of PFAS west, south, and east of the newly-installed wells has not yet been established. The Work Plan should anticipate additional CRSA monitoring wells to assess PFAS extent because PFOA and PFOS concentration either exceed or are only slightly under the health advisory level in Upper CRSA wells DW-3 and M-GW-2/B-M-2.

Comment is noted. No additional monitoring wells are proposed at this time. The primary goal of the next phase of investigation is to delineate the extent of groundwater impacts, to collect data to confirm that off-site migration is not occurring, and to determine hydraulic gradient. The proposed monitoring wells will be installed, monthly gauging will be conducted, and quarterly monitoring will be performed to collect additional data in support of evaluating contaminant migration and hydraulic gradient. Additional wells may be installed following the next phase of investigation, if warranted.

2. Page 2, Section 1.1, second bullet. Sample results at DW-3 (87.35 ng/L PFOA & PFOS) and M-GW-2/B-M-2 (69.84 ng/L PFOA & PFOS) establish that the upper CRSA in the area of the Fire Training Facilities has been impacted by PFAS releases. These monitoring wells are shallow (approximately 80' bgs) relative to the full depth of the CRSA (approximately 250' bgs), and while results at DW-1 and DW-2 appear to show that the upper CRSA North of the release area is not impacted, additional data are needed to assess the deeper CRSA and areas to the West, South, and East.

Comment is noted. No additional monitoring wells are proposed at this time; however, additional wells may be installed following the next phase of investigation.

3. Page 6, Section 2.3, "Groundwater Levels". Understanding groundwater flow direction in the CRSA is important for informing future PFAS delineation in the CRSA. The Work Plan currently proposes to monitor groundwater elevations at three CRSA monitoring wells (summarized in Table 1). Groundwater flow in the CRSA is likely complex, and is likely influenced by the Columbia River stage and operation of the nearby QTA well, which is completed in the CRSA. The groundwater level monitoring program in the CRSA should include all previously evaluated CRSA wells (including the QTA well), monitoring of Columbia River stage, and tracking pumping at the QTA well. Groundwater elevation monitoring using down-hole pressure transducers produces the most accurate understanding of groundwater flow in aquifers with groundwater flow directions influenced by pumping and river stage fluctuations.

Comment is noted. For the next phase of data collection, monthly gauging will be conducted. Pressure transducers may be utilized for future phases of investigation. During monthly gauging activities, Apex will note the river stage from the nearest Columbia River gauging station (USGS 14144700, Vancouver, WA).

4. Table 1 & Figure 3. M-GW-1 and M-GW-2 were originally identified as B-M-1 and B-M-2, respectively, in the Additional Investigation Work Plan dated April 19, 2018. It is PWB's understanding that these were temporary monitoring wells used for sampling in 2017 and were subsequently decommissioned according to OWRD requirements. If that is the case, please confirm and note the original nomenclature for these locations in the figure. If these monitoring wells are still accessible, they should be included in the group of wells identified for gauging and sampling in Table 1.



November 20, 2018  
Page 4

Mr. Dan Hafley, Oregon DEQ  
Response to Comments on Additional Investigation Work Plan Addendum  
Original and Former Fire Training Facilities

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M-GW-1 and M-GW-2 were temporary wells installed at locations originally identified as B-M-1 and B-M-2. There were no permanent monitoring wells installed at these locations.

If you have any questions or would like to discuss this further, please contact me at (503) 924-4704 ext. 1902.

Sincerely,



Adam Reese, C.E.G.  
Division Manager



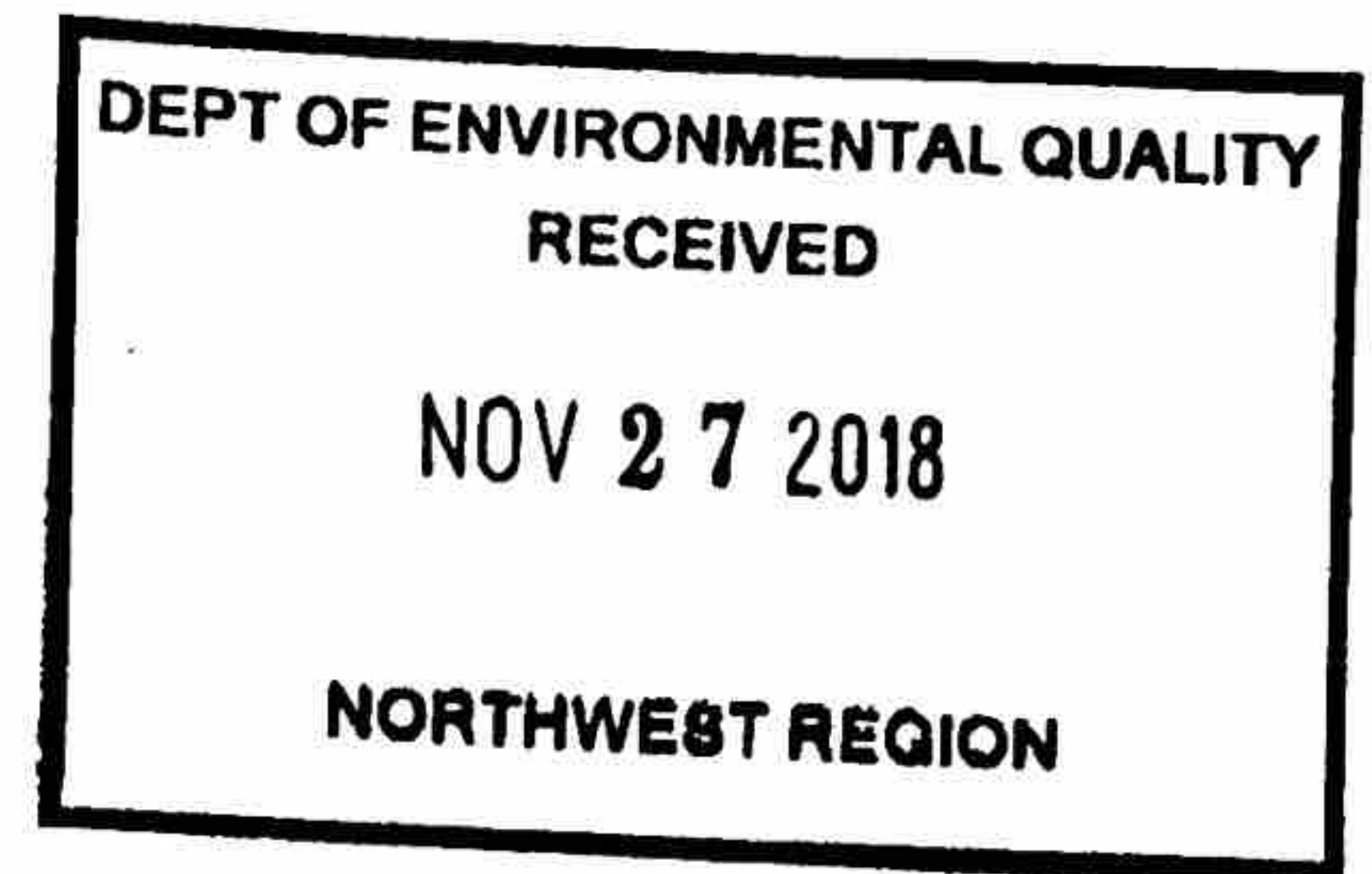
Heather Gosack, R.G.  
Senior Project Manager





November 20, 2018

Dan Hafley  
Oregon Department of Environmental Quality  
4350 NW Front Avenue  
Portland, OR 97210



Re: Response to Comments  
Original and Former Fire Training Facilities, Additional Investigation Results Report  
Portland International Airport  
ECSI No. 3324  
1264-03

Dear Mr. Hafley:

This letter presents responses to comments that were issued by the Oregon Department of Environmental Quality (DEQ) on October 29, 2018 and the City of Portland (City) Water Bureau (PWB) on November 8, 2018 for the October 5, 2018 *Additional Investigation Results Report, Original and Former Fire Training Facilities, Portland International Airport, (Work Plan)* which was prepared by Apex Companies, LLC (Apex) on behalf of the Port of Portland. Agency comments are presented in italics, followed by responses.

### **DEQ Comments**

*1. Section 2.4.3. Please consider adding information on the depth of the CRSA encountered in the source area for borings associated with upper CRSA wells D-1 through D-3.*

Section 2.4.3 has been revised to include information on the depth of the CRSA encountered in wells DW-1 through DW-3.

*2. Section 2.4.5. Discharge of shallow groundwater (via advective transport) to Columbia Slough cannot be ruled out at this time, in particular for contaminant detections in the southerly impact area (say, south of Taxiway B). Installation of a robust shallow groundwater network will be fundamental to confirming groundwater gradient (including seasonal variation) in the PFAS release area.*

Comment is noted.

*3. Section 2.4.5. DEQ's understanding from the Portland Water Bureau is that use of IGA/TGA and CRSA groundwater is not currently contemplated. This is independent of "resource protection."*

Comment is noted.

*4. Section 2.4.5. While the local gradient within Overbank Deposits appears to be southerly based on stormwater system influence, contaminant data suggest a significant westerly component may be present.*

Comment is noted. Additional hydraulic gradient information will be collected during the next phase of investigation.



5. Section 3.2.5. Within the discussion here, please identify the screened interval for sampled irrigation wells. We understand this information is presented elsewhere in the report (tables).

Section 3.2.5 has been revised to include the screened intervals for the sampled irrigation wells.

6. Section 3.2.6. Please discuss IDW management for newly-installed monitoring wells DW-1 through -3. The report should also discuss other IDW management as necessary.

Section 3.2.9 has been added to include information on IDW management for the soil boring and monitoring well installation activities and groundwater sampling activities.

7. Section 4.4. It appears that wells DW-1 to -3 have not yet been surveyed in, which will of course be necessary for determining groundwater gradient. Once all wells are in place and have been surveyed, DEQ recommends collection of elevation data on a regular basis, for example bimonthly (every other month) for a through a full seasonal cycle. Accurately defining groundwater flow direction and gradient is important for both the Overbank Deposits and CRSA aquifers in conceptual site model development.

Comment is noted. The wells will be surveyed in following the next phase of investigation, and monthly groundwater elevation monitoring will then be conducted for a minimum of 12 months to determine groundwater flow direction and gradient.

8. Section 5.0. We agree that contaminant detections in the shallow (OD) aquifer are reasonably well defined, to be confirmed with upcoming monitoring well investigation installation and sampling. Contamination is not, currently, well-delineated to the west and southwest. Additional DEQ concerns from a delineation standpoint are: a) south of B-16 and B-5; and b) north (riverward) of B02; and c) east of B-X-GW and B-9. Also, we note the presence of two former fire stations at the eastern end of the study area (see Figure 3). There are borings north/northwest of these features but not in their immediate vicinity.

Comment is noted. The extent of PFAS impacts will continue to be defined in the next phase of investigation. Following the next phase of well installation and quarterly groundwater monitoring activities, additional work may be conducted if necessary to further define the extent of PFAS impacts.

9. Section 5.0. Soil data are adequate for the time being. DEQ has not, however, ruled out PFAS contamination in soil as a concern. In addition to direct contact and leaching to groundwater, the conceptual site model should consider the potential for migration of PFAS into the storm sewer system.

Comment is noted.

10. Table 7. In Page 2 of 7, we noted that the MW-3 well cover could not be removed. DEQ assumes that this will be addressed prior to future monitoring activities.

Comment is noted. The well cover for MW-3 will be repaired during a future event.

11. Other, Figures. In future documents, it might be helpful to include a figure showing groundwater sampling results relative to stormwater drainage infrastructure (as on Figure 4), which could be useful in assessing the potential for groundwater contaminant infiltration into the sewer.

Comment is noted.



*12. Appendix A. The comprehensive presentation of regulatory standards in this portion of the document is excellent. We have not completed a detailed review of the individual tables at this time, but will consider moving forward and noting that regulatory development for PFAS is proceeding quickly on a number of fronts.*

Comment is noted.

## **PWB Comments**

*1. Depth to groundwater measurements from the three new Upper CRSA wells and the QTA well will provide additional information about groundwater flow directions in the CRSA. We understand that the Port was unable to develop a groundwater elevation contour map for the Report because the well elevations have not yet been surveyed. We look forward to the groundwater elevation contour map being produced, and the map being used to aid in selection of future monitoring well locations.*

Comment is noted.

*2. The borings that were advanced to collect shallow groundwater samples help to delineate the PFAS plume. We agree with the Port that additional delineation is necessary in the northwest, west, and southwest.*

Comment is noted.

*3. Page 15, Section 2.4.4. Note that potentially significant changes to the mechanisms influencing regional hydrogeology have occurred since the cited descriptions and modeling were completed in 1996. Regional groundwater pumping volumes and patterns are almost certainly quite different, as well as factors affecting recharge mechanisms, such as impervious area and UIC/septic system locations and densities.*

Comment is noted. Additional modeling may be conducted in the future as necessary to further understand local hydrogeologic conditions.

*4. Page 16, Section 2.4.5. PWB appreciates the inclusion of a reference to its Columbia South Shore Well Field (CSSWF). The CSSWF is a critical and routinely utilized component of the region's water supply, having been active due to need (emergency, augmentation or both) in 24 of the 34 years since it was first developed. Please also note that the City of Portland holds water rights and easements for future wells closer to the site than the current 3-mile distance to the nearest active supply well.*

Comment is noted.

*5. Page 27, Section 5.0, second bullet. The text states that Upper CRSA groundwater was non-detect (for PFAS) in monitoring wells DW-1 and DW-2. However, Table 4 shows that PFOS was detected in monitoring well DW-1 at low concentrations (1.65 ppt).*

The text in Section 5.0 has been revised to note the low concentration of PFOS detected at DW-1.



Mr. Dan Hafley, Oregon DEQ  
Response to Comments on Additional Investigation Results Report  
Original and Former Fire Training Facilities

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If you have any questions or would like to discuss this further, please contact me at (503) 924-4704 ext. 1902.

Sincerely,



Adam Reese, C.E.G.  
Division Manager



Heather Gosack, R.G.  
Senior Project Manager



3209  
COMM

## HAFLEY Dan

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**From:** Adam Reese <AReese@apexcos.com>  
**Sent:** Wednesday, August 29, 2018 8:05 AM  
**To:** HAFLEY Dan (dan.hafley@state.or.us); Stanton Jones  
**Cc:** Jacobs, Teresa; Read, Daniel; Ashleigh Fines; Herb Clough  
**Subject:** Additional Fire Training Facilities Investigation - DEQ/Port/Apex meeting follow-up

Dan/Stan,

Good morning. The purpose of this email is to briefly summarize discussion and action items that resulted from last Thursday's meeting.

**Meeting Date/Time:** Thursday August 23, 2018 9:00-10:30 AM

**Location:** Port of Portland – PDX HQ

**Attendees:**

- DEQ – Dan Hafley
- Port – Stan Jones
- Apex – Adam Reese

**Results discussion:** In general PFAS concentrations in shallow groundwater (Overbank Deposits) are well-delineated to the EPA HA level to the north, northeast, east (including former fire station area), southeast, and south of the current Fire Training Facilities. Additional shallow groundwater delineation may be required to the northwest, west, and southwest. Deep (CRSA) groundwater results were non-detect in 2 of the 3 newly installed wells and above the EPA HA at 88 ng/L total PFOS/PFOA in one well (DW-3). Stormwater sample results from locations upgradient of the Fire Training Facilities (MH-3 and MH-4) were below the EPA HA, while May 2018 downgradient surface water sample concentrations (SW-2 and SW-3) were generally consistent with October 2017 results. Stormwater concentrations at Outfall 1N were non-detect for PFOS and PFOA in samples collected in May 2018 versus approx. 3,000 ng/L total PFOS/PFOA in the sample collected at OF-1N in October 2017.

**Meeting Outcomes and Action Items:**

- Shallow Groundwater:
  - The Port proposed installing a shallow (Overbank Deposits) monitoring well network, including 16 new monitoring wells. DEQ was in general concurrence with the proposed network, with the addition of one additional well to the southwest of the Fire Training Facilities and adjustment of one location to the northeast of the fire training facilities (east of boring B-9).
  - DEQ requests that the shallow groundwater monitoring program for the proposed network initially (e.g. one year) include monthly gauging and quarterly sampling.
  - Installation of the shallow wells is anticipated to occur in the October/November timeframe.
- Deep Groundwater:
  - DEQ requests sampling of deep (CRSA) groundwater monitoring wells (DW-1, DW-2, and DW-3) for 2 quarters, then possible expansion of the deep well network may be recommended.
- Stormwater:
  - Based on inconsistent results at OF-1N, DEQ requests additional data collection for downstream stormwater (i.e. OF-1N, SW-2, and SW-3 locations).



- DEQ will request that additional sampling be conducted between the fire training areas and the Columbia Slough to better understand the concentrations and movement of PFAS originating at the fire training area.
- The Port is planning to return to the Columbia Slough Watershed Council in the fall to share investigation findings.
- Reports and Work Plans:
  - Apex will prepare an Additional Fire Training Facilities Investigation Data Report, as well as a Work Plan for installation of the shallow groundwater monitoring well network. Apex anticipates that both the Data Report and Work Plan will be provided to DEQ by September 28, 2018.

Please let me know if you have any questions or if you require additional information.

Thanks,

Adam





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JUN 7 2018

NORTHWEST REGION

May 18, 2018

Dan Hafley  
Oregon Department of Environmental Quality  
4350 NW Front Avenue  
Portland, OR 97210

Re: Response to Comments  
Original and Former Fire Training Facilities, Additional Investigation Work Plan  
Portland International Airport  
ECSI No. 3324  
1264-03

Dear Mr. Hafley:

This letter presents responses to comments that were issued by the Oregon Department of Environmental Quality (DEQ) on May 7, 2018 and the City of Portland (City) Water Bureau (PWB) on May 4, 2018 for the April 19, 2018 *Additional Investigation Work Plan, Original and Former Fire Training Facilities, Portland International Airport, (Work Plan)* which was prepared by Apex Companies, LLC (Apex) on behalf of the Port of Portland. Agency comments are presented in italics, followed by responses.

### **DEQ Comments**

**1. Section 1.0, last paragraph.** *Please identify the screening value applied to surface water sampling data ("...detected PFAS concentrations...were below the selected screening values.").*

Section 1.0 has been updated to indicate that detected concentrations in surface water samples were compared to the Maine recreational screening values for qualitative purposes only, as the off-Site ditches are not used recreationally.

**2. Section 1.2, second bullet.** *Identification of wells as "deep" might be misleading given the depth of nearby Port irrigation wells. We suggest (but do not require) that proposed wells in the ~80' bgs range be referenced as "upper CRSA" wells in text. By the same token, it would be better to reference "shallow" wells, at least from a hydrogeological perspective, as Overbank Deposits wells.*

Noted. The Work Plan has been updated to identify the "deep" wells as Upper CRSA wells and "shallow" wells as Overbank Deposit wells.

**3. Section 2.2, last paragraph.** *It would be more accurate to state that "...metals concentrations are in the general range of background."*

Section 2.2 has been updated.



4. Section 2.3.5, next to last paragraph. Currently-inactive City wells P-22 and P-31 are referenced as 3.4 miles southeast of the fire training facilities, and the closest (active?) well as "over 3 miles" to the southeast. Please identify the referenced (TSA) well and the distance to the well, which is presumably greater than 3.4 miles. In the last paragraph, it may be worth mentioning that groundwater present at ~10 feet bgs is in the form of an unconfined water table aquifer.

Section 2.3.5 has been updated to identify the City's active and inactive wells located west of Interstate 205; the distance of the wells from the original and former fire training facilities; and the water bearing unit at the well screen depth.

5. Section 3.2.

- Page 14. To the extent that soil sampling is completed, DEQ recommends collection: a) at ground surface (or immediately below surface vegetation); and b) approximately 5 feet bgs.
- Page 15. We recommend inclusion of well construction details in the section.
- Page 17. Please identify the aquifer units associated with the two irrigation wells proposed for sampling.
- Boring B-15 is identified as a contingency location on Figure 4, but is not discussed in section text. Please clarify.

Noted. Section 3.2 has been updated to include the recommended soil sampling depths, well construction details, irrigation well aquifer units, and rationale for a contingency soil boring location.

6. Section 4.1.

- DEQ notes that TOP assay is proposed for location B-1, as indicated in Table A-1 of Appendix A. Please discuss.

Inclusion of the TOP assay analysis for groundwater at location B-1 was an error. Table A-1 has been revised to indicate that groundwater from location B-1 will be analyzed for per- and polyfluorinated alkyl substances (PFAS) per by EPA Method 537 (modified).

- Please discuss the criteria that will be considered in determining whether analysis of soil samples will occur.

Section 4.1 has been updated to indicate the criteria that will be used to select soil samples for chemical analyses. One soil sample representative of the four distinct areas proposed in the Work Plan (i.e., Former Fire Station (borings B-10 through B-14), northwestern delineation (borings B-1 through B-4), southwestern delineation (borings B-5, B-6, and B-16), and eastern delineation (borings B-7 through B-9), will be initially selected for laboratory analyses if concentrations observed in shallow groundwater collected from the same boring location exceed the EPA HA of 70 ng/L.

Following receipt and review of the initial soil analytical data, additional analysis of soil samples may be performed if concentrations exceed the EPA Regional Screening Level Value (SLV) for occupational direct contact (16,400 µg/kg).

7. Appendix A

- On Page A-4, some well construction details are provided, but well screen slot size and filter pack specifications are not provided. Per Driscoll (1986) and other sources, slot size should be selected for retention of 40-60 percent of formation materials, and filter pack designed to be more permeable than formation materials immediately around the well screen.

Section 2.5 has been updated to include well construction details, including well screen slot size and filter pack.



- *For well completion, a bentonite seal is indicated. Please discuss how this material will be placed and a complete seal ensured. Given the depth of the well and proximity to a PFAS source area, DEQ recommends that seal material be placed using a tremie tube or similar. Please discuss.*

Section 2.5 of Appendix A has been updated to detail the use of a tremie pipe for construction of the bentonite seal of the Upper CRSA wells.

- *On Page A-6, groundwater quality sampling is discussed, but the type of sampling equipment is not specified.*

Field parameters including temperature, pH, oxygen reduction potential, dissolved oxygen, and conductivity will be collected prior to collection of groundwater samples from the irrigation wells. The use of "water quality" parameters was incorrectly stated and has been updated to indicate "field" parameters.

## **Typographic Errors**

*Section 1.0, first paragraph. ...network of deep monitoring wells...*

Section 1.0 has been updated.

*Section 2.3.1, first paragraph. The reference for Leighton and Porcello is misspelled.*

Section 2.3.1 has been updated.

## **PWB Comments**

### **Background Comments**

*The Department of Environmental Quality (DEQ) has provided its comments on the Work Plan to PWB and PWB is in concurrence with DEQ's comments. PWB would like to re-emphasize DEQ's point that the characterization of monitoring wells completed 80' below ground surface as "deep" is not accurate given the vertical extent of the CRSA and the broader sedimentary aquifer system in the Portland Basin. PWB concurs with DEQ's recommendation that these monitoring wells be described as "upper CRSA" wells throughout the Work Plan and other project documents.*

Monitoring wells referred to as "shallow" or "deep" have been updated in the Work Plan as requested.

*The accuracy and completeness of project documents with regard to current and future drinking water supplies is critical to understanding the risk posed by the contamination being investigated. PWB refers to the regulatory uncertainty surrounding future drinking water Maximum Contaminant Levels (MCLs) for the compounds of interest, as articulated in PWB's March 22, 2018 letter to the Port of Portland (Port). Section 2.3.5 of the Work Plan omits some important information regarding municipal groundwater supplies West of I-205. Specifically:*

- *Active production well P-34 (SGA) is located on the same site as the inactive well P-31 (CRSA) cited in the Work Plan;*
- *Active well P-28 (TSA) is located on the same site as the inactive well P-22 (TGA) cited in the Work Plan;*
- *PWB holds water rights and easements for future wells closer to the site than the wells cited above.*

Section 2.3.5 has been updated to reflect the information provided by PWB on wells P-22, P-28, P-31, and P-34, as well as City water rights and easements underlying portions of PDX.



at the next phase of work will involve the collection of groundwater samples from within the DEQ-head Protection Area established for the Columbia South Shore Well Field (CSSWF). Public confidence of groundwater supplied from the CSSWF is of utmost importance to PWB. Please consult and with PWB prior to any communications with stakeholders or the public regarding the quality of or within, and municipal drinking water sourced from, the CSSWF.

The Port will communicate with the DEQ and PWB regarding analytical data prior to submittal of the Investigation Results Report.

### Investigation Comments

One of work in the Work Plan is a good first step towards addressing the following four technical comments, which were included in PWB's March 22 letter to the Port:

- The extent of contamination in the Columbia River Sand Aquifer (CRSA) is not well defined.
- Groundwater flow in the CRSA is not understood and needs to be defined.
- The extent of contamination in the Overbank Deposits (OD) is not well defined.
- Groundwater flow in the OD is not well-defined.

In the CRSA, the Work Plan proposes to install three monitoring wells to measure groundwater quality and flow direction. Because the footprint of the CRSA monitoring wells is smaller than the footprint of the overlying contamination in the OD, the CRSA monitoring wells are unlikely to completely define the extent of contamination and groundwater flow directions. We appreciate the Port's statement that "... the need for additional (CRSA) wells will be assessed based on the data collected from the three proposed (CRSA) wells."

Noted.

In the OD, the Work Plan proposes to install 16 borings for collecting groundwater samples and, potentially, soil samples. Because the Work Plan does not include installation of permanent monitoring wells, the scope of work will not define groundwater flow directions in the OD. The borings may define the extent of contamination in the OD. We appreciate the Port's statement that it is anticipated that "... supplemental monitoring wells will be installed as part of a second phase of work."

Noted.

### Specific Investigation Comments

**Page 14, Section 3.2, Groundwater Levels.** In order to obtain a more comprehensive understanding of groundwater flow directions in the CRSA, we suggest including well PIA-QTA at the Quick Turn Around facility during the water level monitoring events. Water levels at PIA-QTA should be measured on the same day as water levels at the CRSA wells at the Fire Training Facility.

Section 3.2 of the Work Plan and Section 2.2 of Appendix A have been updated to include the gauging of groundwater depth at the PDX Quick Turnaround (QTA) Facility well (PDX-QTA) if feasible. During the first monitoring event of the Upper CRSA wells, the PDX QTA well will be inspected to see if construction will allow for the collection of water levels. The well was installed with an 18-inch reducer and flange.

**Appendix A, Page A-5, Section 2.3, Collection of Groundwater Samples.** Low-flow sampling requires the sampler to monitor drawdown in the well during purging, and maintain a water level drawdown of less than 0.3 feet. We appreciate that drawdown monitoring during well purging is sometimes not possible because down-hole tubing interferes with the water level measurement tape. However, the SAP should specify that water level monitoring will



PWB notes that the next phase of work will involve the collection of groundwater samples from within the DEQ-certified Wellhead Protection Area established for the Columbia South Shore Well Field (CSSWF). Public confidence in the quality of groundwater supplied from the CSSWF is of utmost importance to PWB. Please consult and collaborate with PWB prior to any communications with stakeholders or the public regarding the quality of groundwater within, and municipal drinking water sourced from, the CSSWF.

Noted. The Port will communicate with the DEQ and PWB regarding analytical data prior to submittal of the Additional Investigation Results Report.

### **General Investigation Comments**

The scope of work in the Work Plan is a good first step towards addressing the following four technical comments from GSI, which were included in PWB's March 22 letter to the Port:

- The extent of contamination in the Columbia River Sand Aquifer (CRSA) is not well defined.
- Groundwater flow in the CRSA is not understood and needs to be defined.
- The extent of contamination in the Overbank Deposits (OD) is not well defined.
- Groundwater flow in the OD is not well-defined.

In the CRSA, the Work Plan proposes to install three monitoring wells to measure groundwater quality and flow direction. Because the footprint of the CRSA monitoring wells is smaller than the footprint of the overlying contamination in the OD, the CRSA monitoring wells are unlikely to completely define the extent of contamination and groundwater flow directions. We appreciate the Port's statement that "... the need for additional (CRSA) wells will be assessed based on the data collected from the three proposed (CRSA) wells."

Noted.

In the OD, the Work Plan proposes to install 16 borings for collecting groundwater samples and, potentially, soil samples. Because the Work Plan does not include installation of permanent monitoring wells, the scope of work will not define groundwater flow directions in the OD. The borings may define the extent of contamination in the OD. We appreciate the Port's statement that it is anticipated that "... supplemental monitoring wells will be installed as part of a second phase of work."

Noted.

### **Specific Investigation Comments**

**Page 14, Section 3.2, Groundwater Levels.** In order to obtain a more comprehensive understanding of groundwater flow directions in the CRSA, we suggest including well PIA-QTA at the Quick Turn Around facility during the water level monitoring events. Water levels at PIA-QTA should be measured on the same day as water levels at the CRSA wells at the Fire Training Facility.

Section 3.2 of the Work Plan and Section 2.2 of Appendix A have been updated to include the gauging of groundwater depth at the PDX Quick Turnaround (QTA) Facility well (PDX-QTA) if feasible. During the first monitoring event of the Upper CRSA wells, the PDX QTA well will be inspected to see if construction will allow for the collection of water levels. The well was installed with an 18-inch reducer and flange.

**Appendix A, Page A-5, Section 2.3, Collection of Groundwater Samples.** Low-flow sampling requires the sampler to monitor drawdown in the well during purging, and maintain a water level drawdown of less than 0.3 feet. We appreciate that drawdown monitoring during well purging is sometimes not possible because down-hole tubing interferes with the water level measurement tape. However, the SAP should specify that water level monitoring will



be attempted during sampling. See "Low Stress (low flow) Purging and Sampling Procedure for the Collection of Groundwater Samples from Monitoring Wells," prepared by the Environmental Protection Agency and available online at: <https://www.epa.gov/sites/production/files/2017-10/documents/eqasop-gw4.pdf>.

Section 2.3 of Appendix A has been updated to reflect the monitoring of water levels and restricting pumping drawdown to less than 0.3 foot during groundwater monitoring events.

**Appendix A, Page A-5, Section 2.5, Deep Groundwater Monitoring Well Installation.** Well development should consist of removing 10 well bore volumes as opposed to the three well bore volumes proposed in the Work Plan. In addition, well development should be confirmed by monitoring stability of field parameters (pH, temperature, specific conductance, dissolved oxygen, and turbidity). Please see the DEQ guidance document Groundwater Monitoring Well Drilling, Construction, And Decommissioning for well development procedures, available online at: <http://www.oregon.gov/deq/FilterDocs/GroundwaterMonitoringWellDrilling.pdf>.

Section 2.5 has been updated to include an increase in bore volumes removed and collection of field parameters to document water stability during development of the Upper CRSA wells in accordance with the DEQ guidance document Groundwater Monitoring Well Drilling, Construction, And Decommissioning.

**Appendix A, Page A-4 and A-5, Section 2.5, Deep Groundwater Monitoring Well Installation.** In order to ensure that the bentonite grout well seal meets specifications required by the Oregon Administrative Rules, the subcontracted driller should be required to use a grout float (or similar measurement device) to ensure that the seal meets the requirements of OAR 690-240-0475(2). In our experience, this requirement does not add cost to a drilling project. Given the location of this project in the City's Columbia South Shore Well Field, the Work Plan should state this requirement, and that the field geologist will verify the grout weight meets OWRD requirements. Grout weights should be recorded in the field notebook.

Section 2.5 of Appendix A has been updated to detail the use of a tremie pipe in the discharge of the bentonite seal and field documentation of the grout weight during the construction of the Upper CRSA wells.

**Appendix A, Page A-6, Section 2.8.** Similar to the previous comment about low-flow sampling, the irrigation well sampling should specify that Apex will attempt to monitor the water level in the well during purging.

Section 2.8 of Appendix A has been updated to reflect the monitoring of water levels and pumping drawdown during sample collection of the irrigation wells, if feasible.

If you have any questions or would like to discuss this further, please contact me at (503) 924-4704 ext. 1902.

Sincerely,



Adam Reese, C.E.G.  
Division Manager



Ashleigh Fines  
Project Manager



**HAFLEY Dan**

**From:** HAFLEY Dan  
**Sent:** Monday, May 07, 2018 12:46 PM  
**To:** Stanton Jones; Adam Reese  
**Cc:** 'Ashleigh Fines'; MILLER Sarah; Wise, Douglas; Meyer, Taryn; 'O'Donovan, John'  
**Subject:** Additional Investigation Work Plan, Fire Training Facilities

Stan –

DEQ reviewed the *Additional Investigation Work Plan, Original and Former Fire Training Facilities* for Portland International Airport, prepared on your behalf and dated April 19, 2018. We have a few comments for your consideration, presented below. Please consider these comments and those of the City of Portland, in preparing a revised work plan for review and for approval. To facilitate review of the revised document, please consider submission of both a redline and non-redline version of the revised document.

### Comments

Section 1.0, last paragraph. Please identify the screening value applied to surface water sampling data (“...detected PFAS concentrations...were below the selected screening values.”).

Section 1.2, second bullet. Identification of wells as “deep” might be misleading given the depth of nearby Port irrigation wells. We suggest (but do not require) that proposed wells in the ~80’ bgs range be referenced as “upper CRSA” wells in text. By the same token, it would be better to reference “shallow” wells, at least from a hydrogeological perspective, as Overbank Deposits wells.

Section 2.2, last paragraph. It would be more accurate to state that “...metals concentrations *are in the general range of background.*”

Section 2.3.5, next to last paragraph. Currently-inactive City wells P-22 and P-31 are referenced as 3.4 miles southeast of the fire training facilities, and the closest (active?) well as “over 3 miles” to the southeast. Please identify the referenced (TSA) well and the distance to the well, which is presumably greater than 3.4 miles. In the last paragraph, it may be worth mentioning that groundwater present at ~10 feet bgs is in the form of an unconfined water table aquifer.

### Section 3.2.

- Page 14. To the extent that soil sampling is completed, DEQ recommends collection: a) at ground surface (or immediately below surface vegetation); and b) approximately 5 feet bgs.
- Page 15. We recommend inclusion of well construction details in the section.
- Page 17. Please identify the aquifer units associated with the two irrigation wells proposed for sampling.
- Boring B-15 is identified as a contingency location on Figure 4, but is not discussed in section text. Please clarify

### Section 4.1.



- DEQ notes that TOP assay is proposed for location B-1, as indicated in Table A-1 of Appendix A. Please discuss.
- Please discuss the criteria that will be considered in determining whether analysis of soil samples will occur.

#### Appendix A

- On Page A-4, some well construction details are provided, but well screen slot size and filter pack specifications are not provided. Per Driscoll (1986) and other sources, slot size should be selected for retention of 40-60 percent of formation materials, and filter pack designed to be more permeable than formation materials immediately around the well screen.
- For well completion, a bentonite seal is indicated. Please discuss how this material will be placed and a complete seal ensured. Given the depth of the well and proximity to a PFAS source area, DEQ recommends that seal material be placed using a tremie tube or similar. Please discuss.
- On Page A-6, groundwater quality sampling is discussed, but the type of sampling equipment is not specified.

#### Typographic errors

Section 1.0, first paragraph. ...network *of* deep monitoring wells...

Section 2.3.1, first paragraph. The reference for Leighton and Porcello is misspelled.

Daniel J. Hafley, RG  
Senior Project Manager / Hydrogeologist  
Northwest Region Cleanup Section  
Oregon DEQ





From:	Mr. J. L. Smith, 1234 Main St., Springfield, Mass.
To:	Mr. A. B. Jones, 5678 Elm St., Boston, Mass.
Re:	Letter of the 15th inst. regarding the proposed changes in the regulations of the Springfield Board of Education.
Date:	March 10, 1912
Subject:	Re: Proposed changes in the regulations of the Springfield Board of Education.

I have just received your letter of the 8th inst. regarding the proposed changes in the regulations of the Springfield Board of Education. I have carefully considered the same and am sorry to hear that you are not satisfied with the proposed changes. I am sure that the Board of Education will take the most careful consideration of the same and will make such changes as may be necessary to satisfy the Board.

**Proposed Changes in Regulations**

The proposed changes in the regulations of the Springfield Board of Education are as follows: 1. To increase the number of members of the Board from five to seven. 2. To increase the term of office of the members from two to four years. 3. To increase the salary of the members from \$1000 to \$1500 per annum. 4. To increase the salary of the clerk from \$500 to \$750 per annum. 5. To increase the salary of the secretary from \$400 to \$600 per annum. 6. To increase the salary of the treasurer from \$300 to \$500 per annum. 7. To increase the salary of the auditor from \$200 to \$400 per annum. 8. To increase the salary of the janitor from \$100 to \$200 per annum. 9. To increase the salary of the janitor from \$100 to \$200 per annum. 10. To increase the salary of the janitor from \$100 to \$200 per annum.

I am sure that the Board of Education will take the most careful consideration of the same and will make such changes as may be necessary to satisfy the Board. I am sure that the Board of Education will take the most careful consideration of the same and will make such changes as may be necessary to satisfy the Board. I am sure that the Board of Education will take the most careful consideration of the same and will make such changes as may be necessary to satisfy the Board.

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- 1. To increase the number of members of the Board from five to seven.
- 2. To increase the term of office of the members from two to four years.
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**HAFLEY Dan**

---

**From:** Wise, Douglas <Douglas.Wise@portlandoregon.gov>  
**Sent:** Friday, May 04, 2018 2:42 PM  
**To:** Ashleigh Fines; Stanton Jones  
**Cc:** Teresa Jacobs (teresa.jacobs@portofportland.com); Herb Clough; Heather Gosack; Adam Reese; HAFLEY Dan; Matt Kohlbecker  
**Subject:** RE: Additional Investigation Work Plan for the Original and Former Fire Training Facilities

Thank you for the opportunity to review the *Additional Investigation Work Plan, Original and Former Fire Training Facilities, Portland International Airport*, prepared by Apex and dated April 19, 2018 (Work Plan). The Portland Water Bureau (PWB) and its consultant, GSI Water Solutions (GSI) have completed a review of the Work Plan and offer the following comments.

**Background Comments**

The Department of Environmental Quality (DEQ) has provided its comments on the Work Plan to PWB and PWB is in concurrence with DEQ's comments. PWB would like to re-emphasize DEQ's point that the characterization of monitoring wells completed 80' below ground surface as "deep" is not accurate given the vertical extent of the CRSA and the broader sedimentary aquifer system in the Portland Basin. PWB concurs with DEQ's recommendation that these monitoring wells be described as "upper CRSA" wells throughout the Work Plan and other project documents.

The accuracy and completeness of project documents with regard to current and future drinking water supplies is critical to understanding the risk posed by the contamination being investigated. PWB refers to the regulatory uncertainty surrounding future drinking water Maximum Contaminant Levels (MCLs) for the compounds of interest, as articulated in PWB's March 22, 2018 letter to the Port of Portland (Port). Section 2.3.5 of the Work Plan omits some important information regarding municipal groundwater supplies West of I-205. Specifically:

- active production well P-34 (SGA) is located on the same site as the inactive well P-31 (CRSA) cited in the Work Plan;
- active well P-28 (TSA) is located on the same site as the inactive well P-22 (TGA) cited in the Work Plan;
- PWB holds water rights and easements for future wells closer to the site than the wells cited above.

PWB notes that the next phase of work will involve the collection of groundwater samples from within the DEQ-certified Wellhead Protection Area established for the Columbia South Shore Well Field (CSSWF). Public confidence in the quality of groundwater supplied from the CSSWF is of utmost importance to PWB. Please consult and collaborate with PWB prior to any communications with stakeholders or the public regarding the quality of groundwater within, and municipal drinking water sourced from, the CSSWF.

**General Investigation Comments**

The scope of work in the Work Plan is a good first step towards addressing the following four technical comments from GSI, which were included in PWB's March 22 letter to the Port:

- The extent of contamination in the Columbia River Sand Aquifer (CRSA) is not well defined.
- Groundwater flow in the CRSA is not understood and needs to be defined.
- The extent of contamination in the Overbank Deposits (OD) is not well defined.
- Groundwater flow in the OD is not well-defined.

In the CRSA, the Work Plan proposes to install three monitoring wells to measure groundwater quality and flow direction. Because the footprint of the CRSA monitoring wells is smaller than the footprint of the overlying contamination in the OD, the CRSA monitoring wells are unlikely to completely define the extent of contamination and



groundwater flow directions. We appreciate the Port's statement that "... the need for additional (CRSA) wells will be assessed based on the data collected from the three proposed (CRSA) wells."

In the OD, the Work Plan proposes to install 16 borings for collecting groundwater samples and, potentially, soil samples. Because the Work Plan does not include installation of permanent monitoring wells, the scope of work will not define groundwater flow directions in the OD. The borings may define the extent of contamination in the OD. We appreciate the Port's statement that it is anticipated that "... supplemental monitoring wells will be installed as part of a second phase of work."

#### **Specific Investigation Comments**

GSI offers the following specific comments on the Work Plan to supplement the specific comments provided by DEQ:

- **Page 14, Section 3.2, Groundwater Levels.** In order to obtain a more comprehensive understanding of groundwater flow directions in the CRSA, we suggest including well PIA-QTA at the Quick Turn Around facility during the water level monitoring events. Water levels at PIA-QTA should be measured on the same day as water levels at the CRSA wells at the Fire Training Facility.
- **Appendix A, Page A-5, Section 2.3, Collection of Groundwater Samples.** Low-flow sampling requires the sampler to monitor drawdown in the well during purging, and maintain a water level drawdown of less than 0.3 feet. We appreciate that drawdown monitoring during well purging is sometimes not possible because down-hole tubing interferes with the water level measurement tape. However, the SAP should specify that water level monitoring will be attempted during sampling. See "Low Stress (low flow) Purging and Sampling Procedure for the Collection of Groundwater Samples from Monitoring Wells," prepared by the Environmental Protection Agency and available online at: <https://www.epa.gov/sites/production/files/2017-10/documents/eqasop-gw4.pdf>.
- **Appendix A, Page A-5, Section 2.5, Deep Groundwater Monitoring Well Installation.** Well development should consist of removing 10 well bore volumes as opposed to the three well bore volumes proposed in the Work Plan. In addition, well development should be confirmed by monitoring stability of field parameters (pH, temperature, specific conductance, dissolved oxygen, and turbidity). Please see the DEQ guidance document *Groundwater Monitoring Well Drilling, Construction, And Decommissioning* for well development procedures, available online at: <http://www.oregon.gov/deq/FilterDocs/GroundwaterMonitoringWellDrilling.pdf>.
- **Appendix A, Page A-4 and A-5, Section 2.5, Deep Groundwater Monitoring Well Installation.** In order to ensure that the bentonite grout well seal meets specifications required by the Oregon Administrative Rules, the subcontracted driller should be required to use a grout float (or similar measurement device) to ensure that the seal meets the requirements of OAR 690-240-0475(2). In our experience, this requirement does not add cost to a drilling project. Given the location of this project in the City's Columbia South Shore Well Field, the Work Plan should state this requirement, and that the field geologist will verify the grout weight meets OWRD requirements. Grout weights should be recorded in the field notebook.
- **Appendix A, Page A-6, Section 2.8.** Similar to the previous comment about low-flow sampling, the irrigation well sampling should specify that Apex will attempt to monitor the water level in the well during purging.

Please let me know if you have any questions regarding these comments.

Thank you,

Douglas Wise  
Groundwater Protection Program Manager  
Portland Water Bureau  
400 SW 6<sup>th</sup> Ave., Ste. 400



Portland, OR 97204  
Ph: 503-823-7473  
[Douglas.Wise@portlandoregon.gov](mailto:Douglas.Wise@portlandoregon.gov)  
[www.portlandoregon.gov/water](http://www.portlandoregon.gov/water)

---

**From:** Ashleigh Fines [mailto:AFines@apexc.com]  
**Sent:** Thursday, April 19, 2018 3:07 PM  
**To:** Wise, Douglas <Douglas.Wise@portlandoregon.gov>  
**Cc:** Stanton Jones <Stan.Jones@portofportland.com>; Teresa Jacobs (teresa.jacobs@portofportland.com) <teresa.jacobs@portofportland.com>; Herb Clough <HClough@apexc.com>; Heather Gosack <Heather.Gosack@apexc.com>; Adam Reese <AReese@apexc.com>  
**Subject:** Additional Investigation Work Plan for the Original and Former Fire Training Facilities

Doug,

Good afternoon. On behalf of the Port of Portland, please find attached the *Additional Investigation Work Plan for the Original and Former Fire Training Facilities*. let us know if you have any questions or comments.

Also, please let me know how many hard copies you'd like to receive.

Thanks,  
Ashleigh

 <b>APEX</b> apexc.com	<b>Ashleigh Fines</b>
	Senior Project Manager
	<b>Apex Companies, LLC</b>
	3015 SW First Avenue Portland, OR 97201 O) 503-924-4704 x1903    M) 503-490-8570
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3015 SW First Avenue  
Portland, Oregon 97201-4707  
(503) 924-4704 Phone  
(503) 943-6357 Fax

## TRANSMITTAL MEMORANDUM

**Date:** April 19, 2017

**Project Number:** 1264-04

**Subject:** Additional Investigation Work Plan Original and  
Former Fire Training Facilities, Portland International  
Airport, Portland, Oregon, ECSI No. 3324

**To:** Port of Portland  
Attn: Stan Jones  
7200 NE Airport Way  
Portland, Oregon 97218

<b>WE ARE SENDING YOU:</b> <input checked="" type="checkbox"/> Attached    or <input type="checkbox"/> Under Separate Cover:			
<input checked="" type="checkbox"/> Report	<input type="checkbox"/> Letter	<input type="checkbox"/> Plans	<input type="checkbox"/> Specifications
<input type="checkbox"/> Proposal	<input type="checkbox"/> Contract	<input type="checkbox"/> Samples	<input type="checkbox"/> Other

<b>THESE ARE TRANSMITTED AS CHECKED BELOW:</b>			
<input type="checkbox"/> As Requested	<input checked="" type="checkbox"/> For Your Use	<input type="checkbox"/> For Review and Comment	<input type="checkbox"/> For Approval

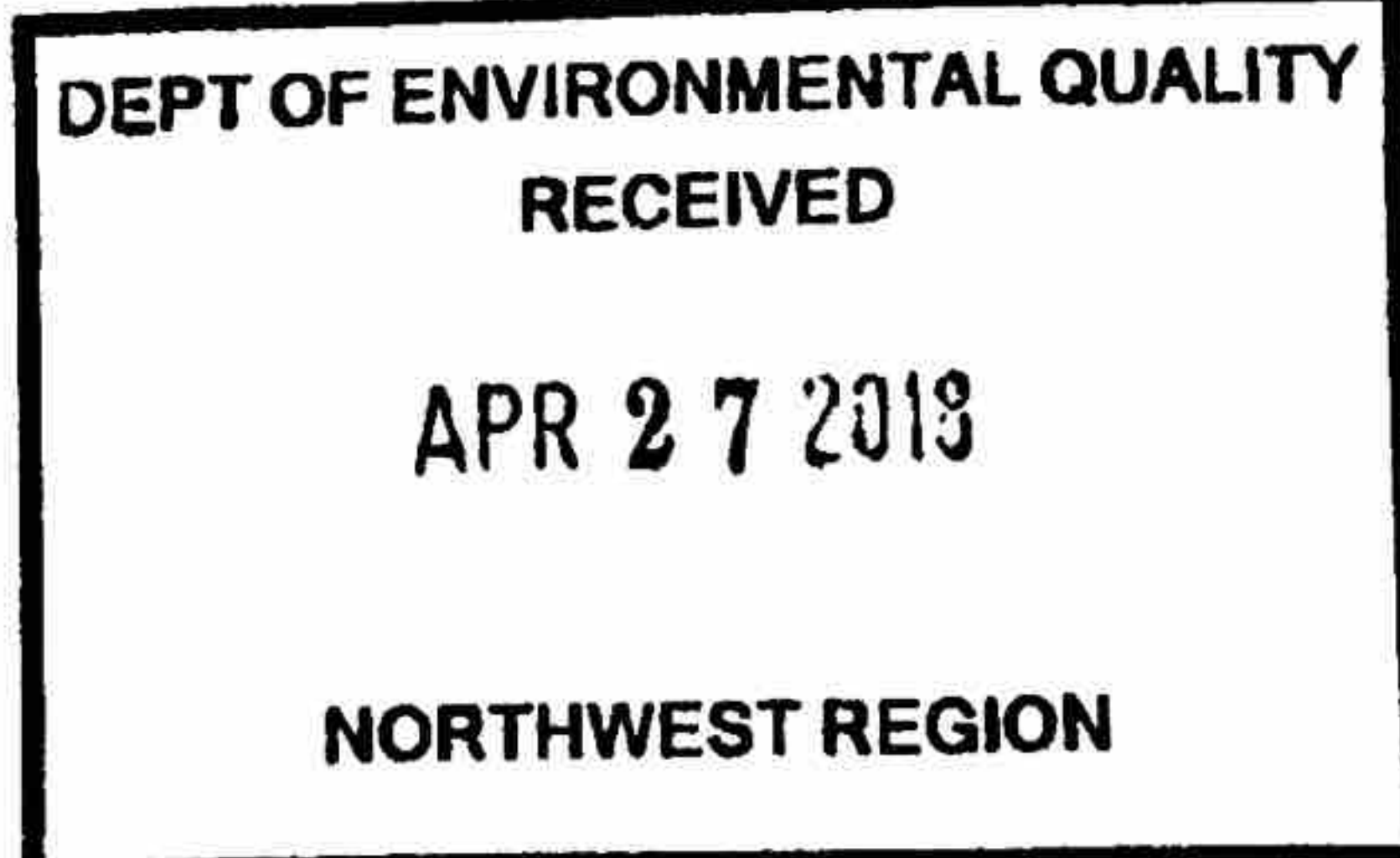
Copies	Date	Description
3	4/19/2018	Revised Original and Former Fire Training Facilities, Investigation Results Report, Portland International Airport, Portland, Oregon, ECSI No. 3324

### Remarks:

Enclosed, please find 3 hard copies with included CD copies of the above-referenced report. Please feel free to contact me if you have any questions. Thank you.

Adam Reese, C.E.G.  
Senior Associate Engineering Geologist

**cc:** Dan Hafley, DEQ (3 hard copies with CDs)





**FLEY Dan**

**m:** Ashleigh Fines <AFines@apexc.com>  
**t:** Thursday, April 19, 2018 3:07 PM  
HAFLEY Dan  
Stanton Jones; Teresa Jacobs (teresa.jacobs@portofportland.com); Herb Clough; Adam Reese; Heather Gosack  
**ject:** Additional Investigation Work Plan for the Original and Former Fire Training Facilities

Good afternoon. On behalf of the Port of Portland, please find attached the *Additional Investigation Work Plan for the Original and Former Fire Training Facilities*. We are sending you 2 hard copies and accompanying CDs in the mail. Please let us know if you have any questions or comments.

Thanks,  
Ashleigh

 <b>APEX</b> apexc.com	<b>Ashleigh Fines</b>
	Senior Project Manager
	<b>Apex Companies, LLC</b>
	3015 SW First Avenue Portland, OR 97201 O) 503-924-4704 x1903 M) 503-490-8570

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CONFIDENTIAL

March 30, 2018

Douglas Wise  
Groundwater Protection Program Manager  
Portland Water Bureau  
1120 SW 5 Avenue, Room 600  
Portland, OR 97204

Re: Response to Comments  
Revised Original and Former Fire Training Facilities, Investigation Results Report  
Portland International Airport  
ECSI No. 3324  
1264-03

Dear Mr. Wise:

This letter presents responses to comments that were issued by the Portland Water Bureau (PWB) on March 22, 2018 for the January 31, 2018 Revised Original and Former Fire Training Facilities, Investigation Results Report (Report), Portland International Airport, which was prepared by Apex Companies, LLC (Apex) on behalf of the Port of Portland (Port). PWB comments are presented in italics, followed by responses.

### **PWB Comments**

**1. Report Section 2.4.5 Site Hydrogeology.** *Discussion of the locations of existing wells in this section appears to be accurate but incomplete. The report omits the City's inactive wells in the CRSA (P-31) and TGA (P-22) as well as its undeveloped groundwater rights that are equidistant or closer to the site than the TSA well that is referenced (P-28). Within the broad well field area secured for municipal water supplies under the City's water rights, which should itself be considered as a location of domestic water use, the City and the Port have recently completed easement negotiations for future municipal well development on several parcels between the City's existing wells and the site. Please consider these specific parcels and the entirety of the CSSWF when determining the proximity of the site to designated drinking water uses.*

Comment is noted and these specific inactive wells, undeveloped groundwater rights, and parcels with easements for future municipal well development will be discussed in future reports.

**2. Report Section 2.5 Screening Levels.** *The EPA Health Advisory Level (HAL) for PFOA/PFOS has limited value as a screening level and should be considered preliminary pending further regulatory action. As noted in the Apex report, some states have already moved to implement drinking water Maximum Contaminant Levels (MCLs) lower than the HAL, raising questions about whether the EPA will ultimately issue MCLs that are also below the HAL. Given the uncertainty surrounding future regulatory conditions for drinking water providers and ongoing study into the health impacts of PFAS compounds, it seems appropriate to use the most protective current drinking water standards as reference levels for evaluating the potential risk the Site may pose to municipal water supplies. It would also be appropriate to identify this uncertainty in the report and condition any risk assessments based on current screening levels as preliminary.*



Comment is noted. The Port concurs that the EPA HAL is preliminary and that there is uncertainty surrounding the state and federal regulatory status of PFAS. The Port is currently working with the DEQ to confirm that its fire training activities have not impacted Portland's municipal well field and the Port is committed to working cooperatively with the State and the City to ensure protection of Portland's drinking water supply.

**3. Technical Issues and Uncertainties.** *The following technical comments were developed by GSI, Inc. on PWB's behalf, and relate primarily to hydrogeologic conditions at the site.*

**3a. The extent of contamination in the CRSA:** *The extent of contamination in the CRSA has not been defined; this is the largest uncertainty relative to understanding risks to the City's groundwater supply sources. Several permanent groundwater monitoring wells should be installed within the CRSA to define the contaminant extent detected in the CRSA. Data from the paired deep borings at the site suggest strong vertical gradients that promote downward flow from the OD to CRSA.*

Comment is noted. Additional investigation is planned to characterize contamination and gradients in the CRSA, including installation of several permanent groundwater monitoring wells in the CRSA. Based on sampling results at the Site to date, additional investigation activities will be conducted to further delineate the extent of shallow soil and groundwater impacts; to identify potential impacts, if any, to deep soil and deep groundwater; and to further assess stormwater and surface water associated with past historical practices at the Site. These activities will be conducted with oversight from the DEQ in accordance with the Voluntary Cleanup Agreement (VCP) between the DEQ and the Port for ECSI No. 3324, dated February 8, 2017. The next phase of additional investigation activities is planned for the second quarter 2018.

**3b. Groundwater flow in the CRSA:** *Groundwater flow in the CRSA is not understood and needs to be defined to understand risks to existing and future groundwater supply wells.*

Comment is noted. Additional investigation is planned to further define groundwater flow in the CRSA.

**3c. The extent of contamination in the OD:** *Apex concludes that the extent of contamination in the OD is defined except in a westerly direction. We agree that the extent to the west is not understood. However, our opinion is that the extent towards the east and northeast is not adequately defined based on the presence of high contaminant concentrations detected in Boring B-G-GW, located northeast of the fire training facilities, poor understanding of groundwater flow in the OD in this area and spatial coverage of monitoring. We understand that airport operations may constrain where monitoring points can be installed; within those constraints, we recommend that a monitoring well be installed east-northeast of Boring B-G-GW.*

Comment is noted. Additional groundwater investigation activities are planned for the Site. Borings will be advanced to the west and to the east-northeast of the fire training facilities for grab groundwater sample collection. Following these sampling events, it is anticipated that additional groundwater monitoring wells will be installed to supplement the existing shallow well network and future groundwater monitoring will be conducted. Results of the additional investigation and monitoring activities will be documented in future reports.

**3d. Groundwater flow in the Overbank Deposits (OD):** *Groundwater flow in the OD is not well-defined, which reduces the confidence in the definition of contaminant extent in the OD. Additional monitoring points located northeast, east, southeast and northwest of the former and current Fire Training facilities would improve confidence in the understanding of groundwater flow in the OD, and thus confidence in the understanding of the extent of contamination. Incidentally, the groundwater elevation contours on Apex's figures contain at least one error and should be re-interpreted (the 8' and 9' contours are joined).*

Comment is noted. The groundwater contour figure contained a drafting error and has been revised (please see attached figure). Furthermore, investigation activities are planned for the Site and these activities will likely include



installation of additional monitoring wells to supplement the existing network. Groundwater elevations based on measurements collected from the enhanced monitoring well network will be included in future reports.

*4. Please also note that PWB has provided a version of its CSSWF Model, developed in collaboration with GSI and likely the most complete hydrogeologic model of the Portland Basin, to the Port and Apex in support of the Port's ongoing efforts to fully characterize the legacy groundwater contamination at the Site. PWB is open to collaboration with the Port and Apex on additional refinements to this model in the vicinity of the Site to render it suitable for fate and transport applications.*

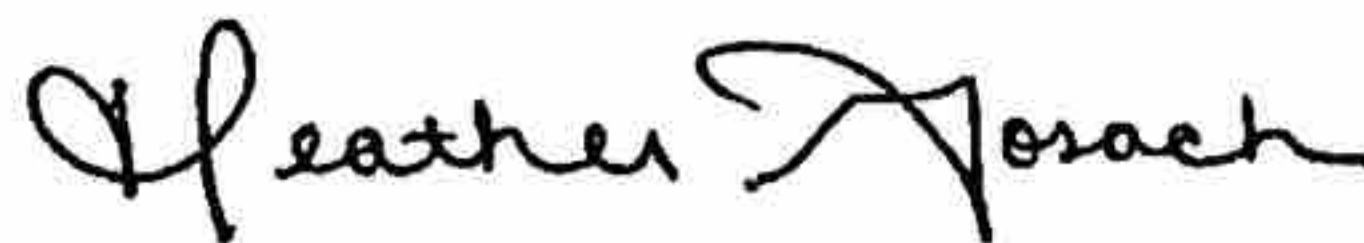
Comment is noted. Moving forward, the Port and Apex will collaborate with PWB on refinements of the CSSWF Model for fate and transport applications as needed.

*5. Air National Guard Base. PWB understands that the Port and the DEQ are also coordinating with the Oregon Air National Guard (ANG) on potential PFAS contamination at that facility. The ANG facility is closer to both the City's active wells and undeveloped CSSWF area, and releases at the ANG facility may therefore present a relatively greater risk to the City's resources than the Site. PWB is interested in further collaboration with ANG on its ongoing investigation and would appreciate an appropriate level of inclusion in discussions between the Port, the DEQ and ANG as well.*

Comment is noted. ANG has communicated that they will collaborate with the City and the DEQ for ongoing investigation activities.

If you have any questions or would like to discuss this further, please contact me at (503) 924-4704 ext. 1902.

Sincerely,

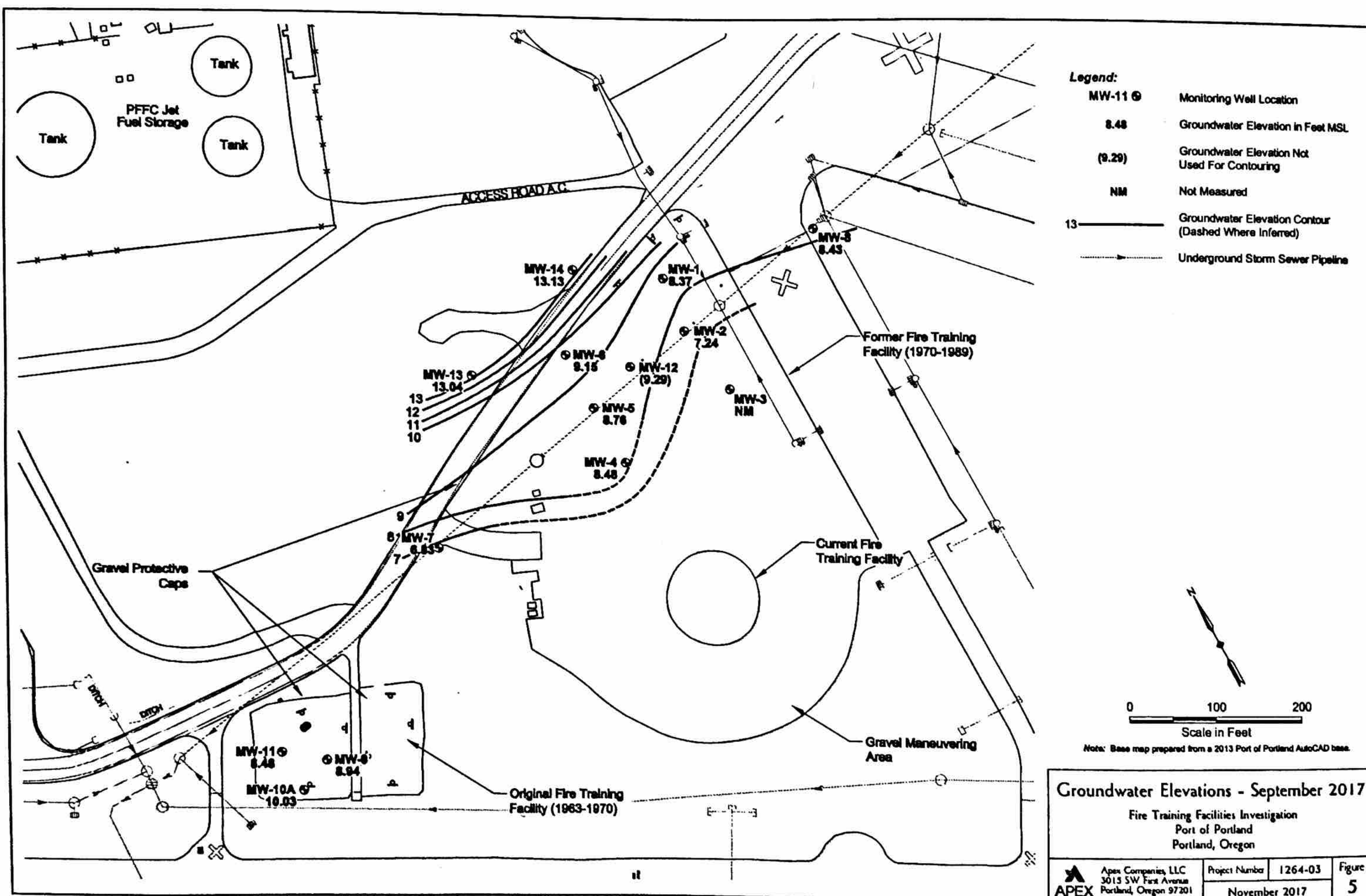


Heather Gosack, R.G.  
Senior Project Manager



Adam Reese, C.E.G.  
Division Manager







DDX PFAS meeting

3/29/18

Herb Clough  
Stan JonesDon Hatley  
Sarah Minerstormwater2 wells east of Terminal  
~ 200' by June - Sept.

prob sample

QTA well - previously sampled

Elrod Ditch - Something needs  
to be done. needs to be dredged.How would DEQ view "maintenance  
dredging" of Elrod Ditch?



3324  
comm

**HAFLEY Dan**

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**To:** Jones, Stan; Wise, Douglas  
**Subject:** PWB Comments on Fire Training Area investigation report

Stan and Doug –

DEQ Cleanup Program staff completed review of the March 22, 2018 letter titled “PDX Fire Training Areas – ECSI #3324”, providing comments on the January 31, 2018 *Revised Original and Former Fire Training Facilities Investigation Results Report* prepared by Apex for the Port of Portland. We also completed supplementary review of the document based on PWB comments.

We are comfortable with comments provided by PWB (and their consultant), some of which mirror those by DEQ, and appreciate supplementary information provided regarding CSSWF wells and current or future groundwater use plans. The information provided by PWB will be helpful as investigation efforts move forward, the ultimate purpose being to confirm that PFAS releases associated with historical fire training activities at PDX do not pose a risk to nearby groundwater resources/users.

Regarding separate ANG investigation efforts, DEQ will forward contact information to PWB and we are happy to answer any questions you may have regarding upcoming investigation efforts by DOD.

Respectfully,

Daniel J. Hafley, RG  
Senior Project Manager / Hydrogeologist  
Northwest Region Cleanup Section  
Oregon DEQ







Nick Fish, Commissioner  
Michael Stuhr, P.E., Administrator

1120 SW 5<sup>th</sup> Avenue, Room 600  
Portland, Oregon 97204-1926  
Information: 503-823-7404  
[www.portlandoregon.gov/water](http://www.portlandoregon.gov/water)



March 22, 2018

Stan Jones  
Senior Manager, Land Quality  
Port of Portland  
PO Box 3529  
Portland, OR 97208

Subject: PDX Fire Training Areas – ECSI #3324

Dear Mr. Jones,

Thank you for the opportunity to review the January 31, 2018 *Revised Original and Former Fire Training Facilities Investigation Results Report* prepared for the Port of Portland by APEX Companies, LLC (APEX). The Portland Water Bureau (PWB), in consultation with GSI Water Solutions, Inc. (GSI), has reviewed the report as well as the Recommended Next Steps conveyed by DEQ to the Port via letter dated March 8, 2017, and prepared the following comments for consideration.

### **Background**

The City of Portland, and the neighboring water districts it supplies, rely on groundwater from the Columbia South Shore Well Field (CSSWF) as a municipal water supply. The CSSWF is a dynamic system currently configured with 26 active wells tapping both regional and localized aquifers in the general vicinity of the Original and Former Fire Training Facilities (Site). The groundwater currently sourced for municipal supply is drawn from the Sand and Gravel Aquifer (SGA), the Troutdale Sandstone Aquifer (TSA), and the Blue Lake Aquifer (BLA). The City also has inactive wells installed in the Troutdale Gravel Aquifer (TGA) and the Columbia River Sand Aquifer (CRSA), and retains undeveloped water rights in all 5 of these aquifers to ensure adequate regional groundwater supplies can be developed as the population continues to grow and water supply variables such as climate change compel PWB to adapt. PWB's concern with regard to the Site, therefore, is the potential for groundwater contamination to affect both current and future groundwater supply sources, and these comments focus on the extent to which the investigations completed to date have been sufficient to evaluate both current and future risks.

### **Report Section 2.4.5 Site Hydrogeology**

Discussion of the locations of existing wells in this section appears to be accurate but incomplete. The report omits the City's inactive wells in the CRSA (P-31) and TGA (P-22) as well as its undeveloped groundwater rights that are equidistant or closer to the site than the TSA well that is



referenced (P-28). Within the broad well field area secured for municipal water supplies under the City's water rights, which should itself be considered as a location of domestic water use, the City and the Port have recently completed easement negotiations for future municipal well development on several parcels between the City's existing wells and the site. Please consider these specific parcels and the entirety of the CSSWF when determining the proximity of the site to designated drinking water uses.

### **Report Section 2.5 Screening Levels**

The EPA Health Advisory Level (HAL) for PFOA/PFOS has limited value as a screening level and should be considered preliminary pending further regulatory action. As noted in the Apex report, some states have already moved to implement drinking water Maximum Contaminant Levels (MCLs) lower than the HAL, raising questions about whether the EPA will ultimately issue MCLs that are also below the HAL. Given the uncertainty surrounding future regulatory conditions for drinking water providers and on-going study into the health impacts of PFAS compounds, it seems appropriate to use the most protective current drinking water standards as reference levels for evaluating the potential risk the Site may pose to municipal water supplies. It would also be appropriate to identify this uncertainty in the report and condition any risk assessments based on current screening levels as preliminary.

### **Technical Issues and Uncertainties**

While both the Overbank Deposits (OD) and CRSA are discussed in detail below, the CRSA is PWB's primary concern for 2 reasons: 1) the CRSA is a potential future source of municipal water supply, as evidenced by the two inactive City wells and water rights in this aquifer; 2) the CRSA is understood to have direct contact to the deeper TSA in the western CSSWF as a result of Columbia River downcutting through the TGA and Confining Unit 1 (CU1) and subsequent deposition of CRSA materials. The City has active wells in the TSA and undeveloped water rights in the TSA in closer proximity to the Site, thus a full understanding of the potential migration of PFAS contamination from the CRSA to the TSA is particularly important to fully characterizing the risk to municipal water supplies.

The following technical comments were developed by GSI, Inc. on PWB's behalf, and relate primarily to hydrogeologic conditions at the site.

- (1) The extent of contamination in the CRSA: The extent of contamination in the CRSA has not been defined; this is the largest uncertainty relative to understanding risks to the City's groundwater supply sources. Several permanent groundwater monitoring wells should be installed within the CRSA to define the contaminant extent detected in the CRSA. Data from the paired deep borings at the site suggest strong vertical gradients that promote downward flow from the OD to CRSA.
- (2) Groundwater flow in the CRSA: Groundwater flow in the CRSA is not understood and needs to be defined to understand risks to existing and future groundwater supply wells.
- (3) The extent of contamination in the OD: APEX concludes that the extent of contamination in the OD is defined except in a westerly direction. We agree that the extent to the west is not understood. However, our opinion is that the extent towards the east and northeast is not adequately defined based on the presence of high contaminant concentrations detected in Boring B-G-GW, located northeast of the fire training facilities, poor understanding of



groundwater flow in the OD in this area and spatial coverage of monitoring. We understand that airport operations may constrain where monitoring points can be installed; within those constraints, we recommend that a monitoring well be installed east-northeast of Boring B-G-GW.

- (4) Groundwater flow in the Overbank Deposits (OD): Groundwater flow in the OD is not well-defined, which reduces the confidence in the definition of contaminant extent in the OD. Additional monitoring points located northeast, east, southeast and northwest of the former and current Fire Training facilities would improve confidence in the understanding of groundwater flow in the OD, and thus confidence in the understanding of the extent of contamination. Incidentally, the groundwater elevation contours on APEX's figures contain at least one error and should be re-interpreted (the 8' and 9' contours are joined).

Please also note that PWB has provided a version of its CSSWF Model, developed in collaboration with GSI and likely the most complete hydrogeologic model of the Portland Basin, to the Port and Apex in support of the Port's on-going efforts to fully characterize the legacy groundwater contamination at the Site. PWB is open to collaboration with the Port and Apex on additional refinements to this model in the vicinity of the Site to render it suitable for fate and transport applications.

#### **Air National Guard Base**

PWB understands that the Port and DEQ are also coordinating with the Oregon Air National Guard (ANG) on potential PFAS contamination at that facility. The ANG facility is closer to both the City's active wells and undeveloped CSSWF area, and releases at the ANG facility may therefore present a relatively greater risk to the City's resources than the Site. PWB is interested in further collaboration with ANG on its on-going investigation and would appreciate an appropriate level of inclusion in discussions between the Port, DEQ and ANG as well.

PWB looks forward to reviewing additional investigation results and continued collaboration with the Port and DEQ on this Site. Please do not hesitate to contact me with any questions or concerns you may have regarding these comments.

Sincerely,



Douglas Wise

Groundwater Protection Program Manager

cc:

Janet Senior, Source Protection Manager, PWB

Scott Bradway, Water Quality Information Manager, PWB

Adam Reese, Apex

Dan Hafley, DEQ

Walt Burt, GSI

Roger Rein, ANG



**HAFLEY Dan**

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**From:** HAFLEY Dan  
**Sent:** Thursday, March 08, 2018 3:16 PM  
**To:** 'Jones, Stan'  
**Cc:** 'Wise, Douglas'  
**Subject:** Request for fire training area follow-up  
**Attachments:** Phase II Follow-Up - March 2017.pdf

Stan –

As outlined in the attached letter, DEQ requests additional work by the Port of Portland associated with historical fire training area, the purpose being to identify the nature and extent of PFAS contaminant releases and confirm that they do not pose a current or future threat to nearby groundwater resources including the Columbia South Shore wellfield.

Dan Hafley





# Oregon

Kate Brown, Governor

## Department of Environmental Quality

Northwest Region

700 NE Multnomah Street, Suite 600

Portland, OR 97232

(503) 229-5263

FAX (503) 229-6945

TTY 711

March 8, 2018

Stan Jones  
Port of Portland  
PO Box 3529  
Portland, OR 97208

Re: Recommended Next Steps  
PDX Fire Training Areas  
ECSI # 3324

Mr. Jones:

DEQ staff have reviewed and approve the *Revised Original and Former Fire Training Facilities, Investigation Results Report* prepared by Apex on the behalf of the Port of Portland and dated January 31, 2018. The report was revised to address DEQ's January 4, 2018 comments on a draft version of the report. DEQ also approves a response-to-comments letter (Apex; January 31, 2018) submitted with the revised report.

Investigation results presented in the report confirm the release of per- and polyfluoroalkyl substances (PFAS) in groundwater near historical fire training areas on the Portland International Airport property, including PFOS and PFOA. The vertical and horizontal extent of contamination are better understood with completion of this phase of work, but have not been fully delineated, nor are data adequate to determine to rule out impacts to groundwater resources. Notable data gaps exist to the northeast and southwest of the training areas, and at depth in the original release area. Sampling identified significant levels of contamination in stormwater during dry season conditions, including at the discharge point for area surface water to Columbia Slough. Soil impacts, while present, were determined to be modest.

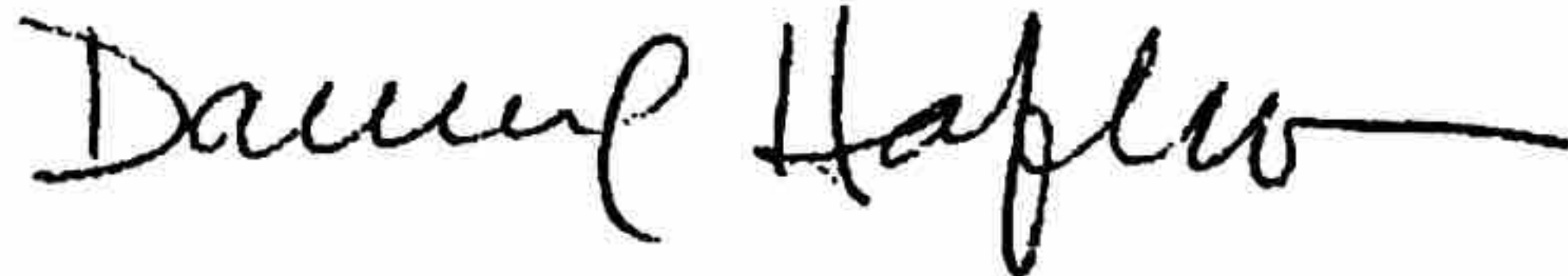
To confirm the absence of impacts, or the potential for future impacts associated with contaminant migration, DEQ recommends that the Port of Portland move forward with additional groundwater investigation, the purpose being to determine the full nature and extent of PFAS contamination in groundwater. Data are necessary to confirm that current or potential future impacts to local groundwater supplies/users, including the City of Portland South Columbia Wellfield. At this point of investigation, you should consider not only one-time samples, but also installation and monitoring of permanent groundwater monitoring wells. You should likewise consider sampling of existing wells located between the fire training "source area" and nearby City wells.



In addition, infiltration of contaminated groundwater from the fire training area and a local sewer and nearby ditch appears to be occurring based on 2017 “dry season” sampling. We recommend a second round data collection, representing “wet season” conditions, to better understand contaminant release to the sewer and ditch, both of which discharge to Columbia Slough.

Please contact me at (503) 229-5417 or [hafley.dan@deq.state.or.us](mailto:hafley.dan@deq.state.or.us) if you have questions or comments.

Sincerely,



Daniel Hafley  
Senior Project Manager/Hydrogeologist  
Northwest Region Cleanup Section

Ec: Sarah Miller, DEQ  
Adam Reece, Apex  
Ashleigh Fines, Apex  
Roger Rein, ANG  
Doug Wise, City of Portland

Cc: ECSI# 3324 File





# Oregon

Kate Brown, Governor

Department of Environmental Quality  
Northwest Region  
700 NE Multnomah Street, Suite 600  
Portland, OR 97232  
(503) 229-5263  
FAX (503) 229-6945  
TTY 711

March 1, 2018

Elena Nilsen  
U.S. Geological Survey  
2130 SW 5th Ave.  
Portland, Oregon 97201

Re: Columbia Slough PFASs Research Proposal

Dear Ms. Nilsen;

Oregon Department of Environmental Quality (DEQ) supports the U.S. Geological Survey's proposal to the Department of Defense Strategic Environmental Research and Development Program to assess the bioaccumulation, biotransformation and biomagnification of per- and polyfluoroalkyl substances (PFASs) in the Columbia Slough foodweb. The Columbia Slough receives stormwater runoff from two aviation facilities that have historically used aqueous film forming foams for fire-fighter training which contain PFASs. The proposed study will also assess whether Polar Organic Chemical Integrative Samplers can be used as a surrogate for uptake of PFASs by organisms.

Industrial and urban development along the Columbia Slough over the past 100 years has resulted in the accumulation of a variety of contaminants in Columbia Slough sediments, some of which bioaccumulate and have also been found in fish tissue collected from the Slough. DEQ is working to complete source control and sediment hotspot work throughout the Slough to improve environmental conditions. USGS' proposed research will complement DEQ's long term work to improve the Columbia Slough.

PFAS are not currently defined in DEQ rules as regulated hazardous substances, however we support the proposed research to better understand emerging contaminants and ecological foodweb effects. DEQ is tracking the multiple environmental and human health issues related to PFASs in response to growing body of research on the toxicity and persistence of this class of chemicals. The findings of the USGS study could provide data to support other DEQ efforts addressing PFAS concerns.

If you have any questions please contact Sarah Miller, Columbia Slough Sediment project manager at 503-229-5040 or [miller.sarah@deq.state.or.us](mailto:miller.sarah@deq.state.or.us)

Sincerely,

Paul Seidel  
NWR Cleanup Program Acting Manager



2527  
comu

**HAFLEY Dan**

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**From:** HAFLEY Dan  
**Sent:** Tuesday, February 13, 2018 1:49 PM  
**To:** Stanton Jones  
**Cc:** 'Adam Reese'; Ashleigh Fines; Herb Clough; MILLER Sarah  
**Subject:** Revised Fire Training Facilities investigation report

Stan –

DEQ staff have reviewed and approve the *Revised Original and Former Fire Training Facilities, Investigation Results Report* prepared by Apex on the behalf of the Port of Portland and dated January 31, 2018. The report was revised to address DEQ's January 4, 2018 comments on a draft version of the report. Submission of the revised report included a response-to-comments letter (Apex; January 31, 2018) that is likewise approved.

Investigation results presented in the report confirm the release of per- and polyfluoroalkyl substances (PFAS) in groundwater in the vicinity of historical fire training areas on the Portland International Airport property, including PFOS and PFOA. The vertical and horizontal extent of contamination is better understood with this phase of investigation, but has not been fully delineated. Notable data gaps exist to the northeast and southwest of the training areas, and at depth in the original release area. Sampling identified significant levels of contamination in stormwater during dry season conditions, including at the discharge point for area surface water to Columbia Slough. Soil impacts, while present, were determined to be modest.

We recommend that the Port of Portland move forward with additional groundwater investigation, the purpose being to determine the full nature and extent of PFAS contamination in groundwater, and confirm that there is no potential for impacts to local groundwater supplies/users, including the City of Portland South Columbia Wellfield. At this point of investigation, you should consider not only one-time samples, but installation and monitoring of permanent groundwater monitoring wells. Sampling of existing wells located between the fire training "source area" and nearest City wells should likewise be considered.

The source of PFAS-impacted surface water has not been identified, but groundwater-to-surface water migration is likely to represent at least a contributing source. The Port should consider a second round of stormwater data collection, representing wet season conditions, to understand the mechanism of contaminant release and the extent of contaminant loading to Columbia Slough on a seasonal basis.

I can be reached at (503) 229-5417 if you have questions or comments.

Daniel J. Hafley, RG  
Senior Project Manager / Hydrogeologist  
Northwest Region Cleanup Section  
Oregon DEQ







3015 SW First Avenue  
Portland, Oregon 97201-4707  
(503) 924-4704 Phone  
(503) 943-6357 Fax

## TRANSMITTAL MEMORANDUM

<b>Date:</b> February 1, 2017	<b>Project Number:</b> 1264-03
<b>Subject:</b> Revised Original and Former Fire Training Facilities, Investigation Results Report Portland International Airport, Portland, Oregon, ECSI No. 3324	

**To:** Port of Portland  
Attn: Stan Jones  
7200 NE Airport Way  
Portland, Oregon 97218

<b>WE ARE SENDING YOU:</b> <input checked="" type="checkbox"/> Attached or <input type="checkbox"/> Under Separate Cover:			
<input checked="" type="checkbox"/> Report	<input type="checkbox"/> Letter	<input type="checkbox"/> Plans	<input type="checkbox"/> Specifications
<input type="checkbox"/> Proposal	<input type="checkbox"/> Contract	<input type="checkbox"/> Samples	<input type="checkbox"/> Other

<b>THESE ARE TRANSMITTED AS CHECKED BELOW:</b>			
<input type="checkbox"/> As Requested	<input checked="" type="checkbox"/> For Your Use	<input type="checkbox"/> For Review and Comment	<input type="checkbox"/> For Approval

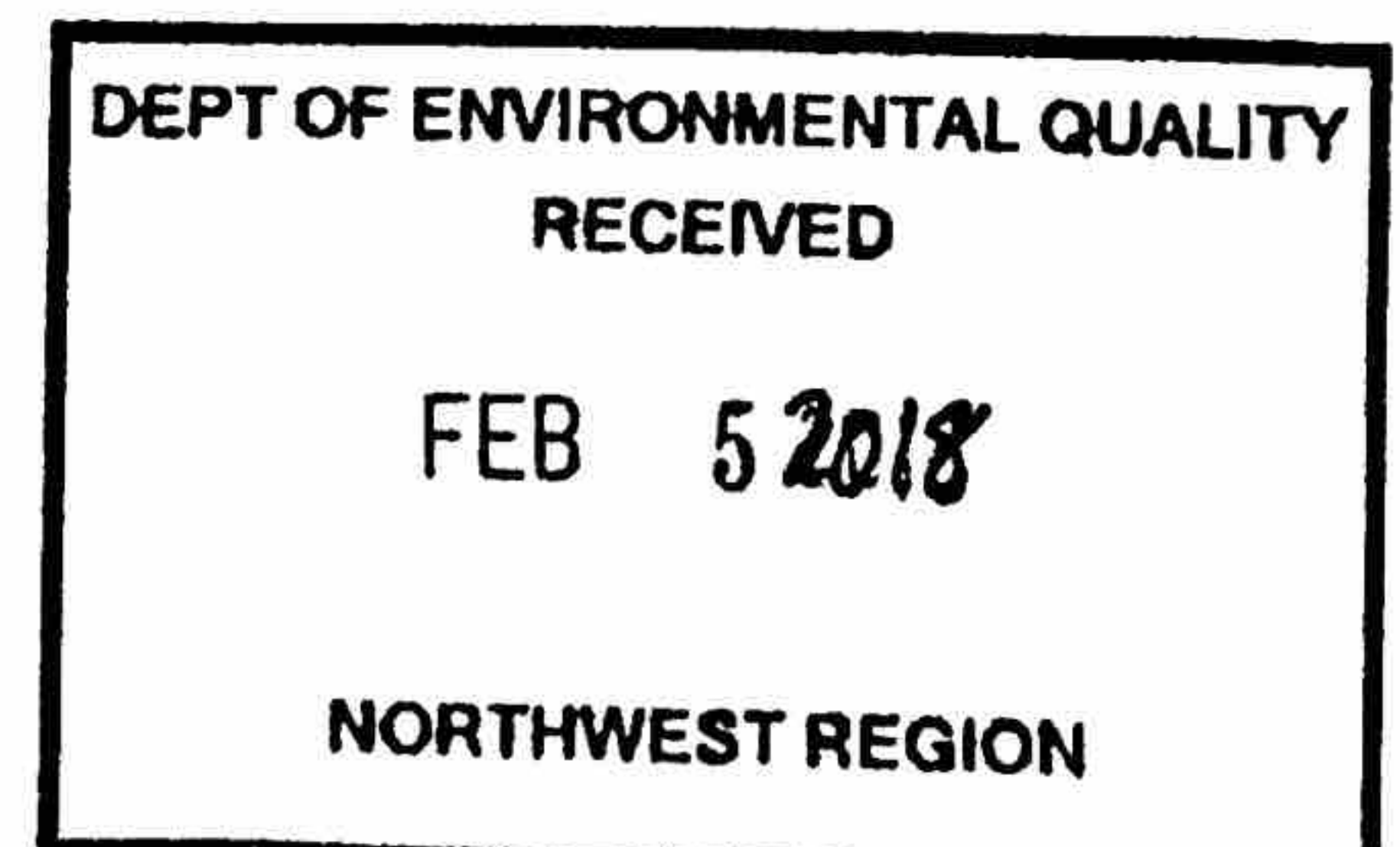
Copies	Date	Description
3	1/31/2018	Revised Original and Former Fire Training Facilities, Investigation Results Report, Portland International Airport, Portland, Oregon, ECSI No. 3324

### Remarks:

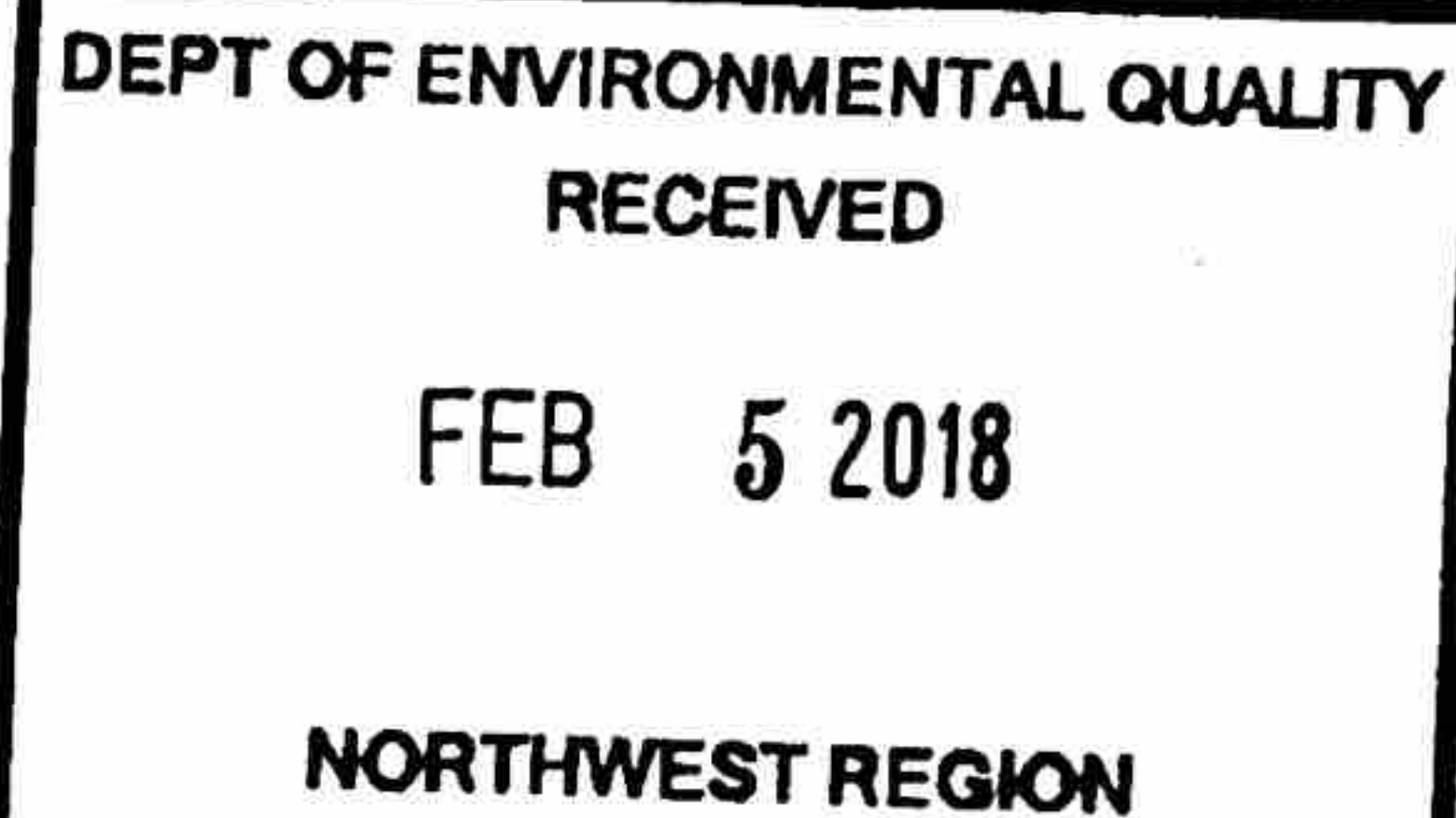
Enclosed, please find 3 hard copies with included CD copies of the above-referenced report. Please feel free to contact me if you have any questions. Thank you.

Adam Reese, C.E.G.  
Senior Associate Engineering Geologist

cc: Dan Hafley, DEQ (2 hard copies with CDs)







January 31, 2018

Dan Hafley  
Oregon Department of Environmental Quality  
4350 NW Front Avenue  
Portland, OR 97210

Re: Response to Comments  
Original and Former Fire Training Facilities, Investigation Results Report  
Portland International Airport  
ECSI No. 3324  
1264-03

Dear Mr. Hafley:

This letter presents responses to comments that were issued by the Oregon Department of Environmental Quality (DEQ) on January 4, 2018 for the December 13, 2017 Original and Former Fire Training Facilities, Investigation Results Report (Report), Portland International Airport, which was prepared by Apex Companies, LLC (Apex) on behalf of the Port of Portland. This response letter also addresses the soil screening level analysis completed by DEQ Human Health Toxicologist and forwarded to the Port on January 4, 2018. Agency comments are presented in italics, followed by responses.

## **DEQ Comments**

### **General Risk Screening Comments**

*1. The distinction between "drinking water" values presented in Tables A-1 and A-2, and "groundwater" values presented in Tables A-3 and A-4, is unclear. Please clarify.*

Tables A-3 and A-4 have been revised to distinguish screening values identified for drinking water and groundwater. The tables are contained in Appendix A of the attached Revised Original and Former Fire Training Facilities, Investigation Results Report (Revised Report).

*2. For surface water exposure (Table A-5), the "construction worker" exposure scenario has been selected for risk screening. While this might be appropriate for human exposure within the confines of the (secured) PIA property, we recommend the use of "recreational" values from Maine in screening stormwater discharge to Columbia Slough. Alternately, the "non-drinking surface water" value from Michigan could be considered. Risk screening results should be updated accordingly.*

Table 7 and Section 4.5 of the Report have been updated to include screening of off-site surface water samples to the Maine recreational screening values (used for qualitative purposes only) identified in Table A-5.

*3. In Table A-7, EPA RSLs for protection of groundwater should be highlighted for consideration in assessing the potential for contaminant leaching. DEQ notes that these are discussed in report text.*

Noted. Table A-7 has been updated to highlight the EPA Risk-based Screening Levels for protection of groundwater.



4. We recommend inclusion of a table in Appendix that summarizes values being used for site-related risk screening, along with the source of the values.

Table A-10 has been prepared that identifies the selected SLVs used in the assessment of data collected during the investigation and the source of those SLVs. The table is included in Appendix A of the Revised Report.

5. In early 2017, Air National Guard representatives proposed screening values for upcoming PFAS investigation at the Portland ANG facility, located adjacent to PIA on Port of Portland property. Analysis of screening results should include discussion of these values and how they align with or differ with those for your site. A copy of the email outlined the proposed ANG values is included as an attachment to this letter.

Noted. Sections 2.5, 4.2, 4.5, and 4.6 have been revised to include a discussion of the ANG proposed soil, sediment, and surface water SLVs, how they differ from the selected SLVs for the Site, and how investigation results compare to the ANG proposed SLVs. The proposed ANG SLVs for groundwater are the same as those selected for this investigation.

## Specific Comments

### Section 2.4.

1. We recommend a more details discussion of geology here, relying on Section 3.2.2 of the 2012 Land and Beneficial Water Use Survey Update prepared by Ash Creek Associates for the Port. As noted in the report, sand-dominated deposits comprising the CRSA represent a paleo-channel of the nearby Columbia River. During emplacement, scouring of older, underlying TGA and CU1 strata occurred. The CRSA represents a distinct hydrostratigraphic unit. Outside of CRSA occurrence, coarser-grained deposits of the Unconsolidated Gravel Aquifer/upper Troutdale Gravel Aquifer commonly underlie shallow Overbank Deposits, and can be as little as 40 feet below ground surface. Cross sectional diagrams presented in the above-cited report suggest that the investigation area is fully underlain by the CRSA, although the depth at which it is encountered (below Overbank Deposits), and the total thickness of the unit, are variable from point-to-point.

Section 2.4 has been revised to include a more detailed discussion of the regional and Site geology, including hydrogeology in and adjacent to PDX.

2. Text indicates that the CRSA is used as drinking water source. Please indicate whether this is referencing domestic or municipal use, as we are not aware of any current use of the CRSA (or TGA) by the City of Portland.

Section 2.4.5 has been updated to indicate that the CRSA is not generally used as a drinking water source for the City of Portland. The Revised Report also includes the preparation of Table 10 presenting the water well I.D., type, depth, location, and other pertinent information of wells identified within a one-mile radius centered on the original and former fire training facility. Additionally, Figure 9 has been prepared to present the location and type of water wells within one mile of the original and former fire training facilities and the Locality of Facility as identified in the 2012 Land and Beneficial Water Use Survey Update.

One water well (irrigation well MULT 913) was identified within a one-mile radius of the original and former fire training facilities. The well was completed to a depth of 166 feet bgs and the screened interval is not identified on the well log. Based on a review of the well log, the CRSA and Troutdale Gravel Aquifer (TGA) are present. Domestic use water well MULT 1104, a little more than one mile east of the original and former fire training facilities is installed to a depth of 205 bgs and screened from 122 to 250 feet bgs. According to the well log, well MULT 1104 is screened in the CRSA.



**3.** *We recommend inclusion of information in the report identifying all wells located within one mile of the facility. Alternatively, a focused beneficial water use determination might be completed and submitted separately.*

Water wells that have been identified within a one-mile radius centered on the original and former fire training facilities are included in Table 10 and presented on Figure 9. Additionally, an update of the water wells identified in Locality of Facility as defined in the Beneficial Land and Water Use Survey Update (Apex, 2012) has been completed and those wells presented on Table 10 and Figure 9.

**4.** *Please include discussion of the QTA well in reference to local groundwater use. Here and in Section 3.2.8, please identify the non-potable use that is contemplated (car washing?) for the well.*

Section 3.2.8 has been updated to indicate the industrial use of water from the QTA well for automotive washing associated with the new QTA facility.

**Section 2.5.** *Please see our comment above regarding inclusion of a "recreational" user screening value for surface water (or groundwater) that might discharge to Columbia Slough. Also, while we understand that wildlife are discouraged from site use, some exposure to terrestrial ecological receptors could occur. Please consider.*

Portland International Airport (PDX) has a robust Wildlife Management Program that strives to discourage, disrupt and remove wildlife species of concern from the airfield. The PDX Wildlife Program operates under a Federal Aviation Administration (FAA) authorized Wildlife Hazard Management Plan that includes long-term and short-term strategies to provide a safe airfield environment. PDX Wildlife Staff is on site daily to respond to the presence of wildlife that poses a risk to aircraft operations. While we agree some exposure to ecological receptors could occur, as a result of aggressive measures by the Port to discourage wildlife from the area these actual exposures would be less than the assumptions used in developing the screening criteria. Table 7 and the screening evaluation for surface water have also been updated to reflect the addition of Maine's recreational user SLV for off-site surface water samples.

**Section 3.2.4.** *We understand that adding water during drilling was necessary to prevent/minimize sand heaving, but note that equal amounts of water were added and subsequently withdrawn (45 gallons). DEQ would typically recommend removing significantly more water than added to confirm removal of all added water and the representativeness of subsequent sampling effort.*

Noted. Future groundwater monitoring and investigation activities will collect groundwater from depth to support the analytical data from the deep groundwater samples collected in October 2017. If future well installations or temporary borings exhibit similar sand heaving, additional volumes of water, greater than added, will be removed prior to sampling.

**Section 3.2.8.** *Text indicates that well construction occurred over a period of approximately four months. Please clarify. Regarding sample collection at the "wellhead", please identify the type of well pump that has been installed in the well (permanently, we assume). The sampling results are informative but not, by themselves, definitive in terms of ruling out impacts to water wells/users to the east.*

Under the direction of GSI Water Solutions, Inc., Schneider Water Services, installed the well with a cable tool drilling rig and encountered several large boulders resulting in an extended construction timeframe. A copy of the GSI technical memorandum documenting the well installation activities is provided as Appendix G, and Section 3.2.8 has been updated.



**Section 4.1.** *What is the nature of the "waxy yellow buildup" observed during the sewer survey? Might it be contaminant-related, or instead represent mineral staining associated with groundwater seepage into the sewer.*

The nature of the waxy yellow buildup is unknown. This material was not sampled or characterized, and the nature of the material was not discernable from the video survey.

**Section 4.3.** *The "new" observance of NAPL in MW-12 is interesting. Please discuss whether the observation of petroleum product at this location is consistent with the contaminant release model.*

The Port has not used petroleum products in the original and former fire training areas since the late 1970s (original fire training facility), and the late 1980s (former fire training facility). The appearance of product appears to be related to changes in groundwater elevation. For example, at MW-12, product has been observed during a period of low groundwater elevation that immediately follows a period of time with high groundwater elevation. This is an indicator of residual product that is occasionally observed in the monitoring wells at the site. Additional monitoring will be conducted during future follow-up investigation activities to monitor the product observed in well MW-12.

**Section 4.4.1 (and Executive Summary).** *Based on DEQ contouring of groundwater data for PFOA and PFOS, horizontal contaminant delineation is incomplete to both the northeast (see location B-X-GW) and west/southwest. We expect the next phase of site work to include installation of permanent wells for more reliable (and longer-term) groundwater monitoring.*

Noted. Phase III will include activities to delineate to the northeast and west/southwest.

**Section 4.4.5.** *More interpretation of TOP Assay results would be helpful, including use of analytical data to support the conclusion that detected PFAS compounds are unlikely to "weather to substances of concern such as PFOA."*

A revised discussion of the TOP Assay results is included in Section 4.4.5.

**Section 4.6.** *DEQ notes that the laboratory reporting limit (2,050 ng/kg) exceeds the recreational sediment screening level (Maine) presented in Table A-9. Please discuss whether this was the lowest detection limit that could be achieved.*

The Maine screening level is 1,500,000 ng/kg for PFOA and 20,000,000 ng/kg for PFOS. The laboratory reporting limit is below both of these screening levels.

**Section 5.0.** *Please see comments above.*

Please see revised portions of Sections 3 and 4 in the report.

**Figures 4 and 7.** *The legend for these figures notes highlighting of EPA health advisory concentrations for drinking water, but non-EPA, media-specific risk-based screening levels are also provided in the figures. It is unclear which "screening criteria" are being applied in highlighting.*

The figures have been updated and are provided in the Revised Report.

**Tables.** *We recommend adding a table to the report identifying the screened intervals for sampled groundwater wells, and the sampling (temporary well screen) interval for one-time groundwater samples.*

Table 9 has been prepared and included in the Revised Report providing details on the depth and screened intervals for permanent and temporary where groundwater samples were collected.



**Appendix A.** See general comment above. Also, the appendix is titled "Survey of PFOS Screening Values". We believe it should instead be titled "Survey of PFAS Screening Values".

Noted. The title for Appendix A has been revised in the table of contents to read Survey of PFAS Screening Values.

**Appendix D.** DEQ notes that there were a number of minor problems identified in the QA/QC analysis, perhaps the most notable being exceedance of sample holding times for multiple samples for PFAS analysis, and LCS/LCSD recoveries outside of control limits. The data nevertheless seem to be acceptable for screening purposes.

Vista Analytical prepared groundwater from boring locations and surface water outside of the 14-day EPA-recommended hold time. These samples were initially prepared within hold time; however, the method blank in the analytical batch indicated signs of laboratory contamination that may have contributed to sample concentrations. To minimize or eliminate this contribution, the laboratory prepared the samples a second time, with a new method blank and analyzed for PFOS, PFHxS, and PFHxA. In comparing results between the samples prepared within hold time and those prepared outside hold time, concentrations of PFOS, PFHxS, and PFHxA generally decreased for samples prepared outside of hold when concentrations were less than 10 ng/L. This is likely due to the reduction in contamination influence from the laboratory during the second preparation. However, for concentrations greater than 10 ng/L, the second preparation generally yielded concentrations greater than the previous sample runs. Decreases in concentration were less than 30 percent different from the initial result or had greater chance for error due to dilution. When comparing both analyses against screening levels provided in Table 3 and Table 7, the initial and secondary analysis exceeded the same screening levels.

A second lab report for 1701173 from Vista Analytical that includes PFOS, PFHxS, and PFHxA results prepared and analyzed within hold time is provided in Appendix D.

If you have any questions or would like to discuss this further, please contact me at (503) 924-4704 ext. 1902.

Sincerely,



Adam Reese, C.E.G.  
Division Manager



Ashleigh Fines  
Project Manager



**HAFLEY Dan**

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**From:** HAFLEY Dan  
**Sent:** Monday, February 05, 2018 8:49 AM  
**To:** VROOMAN Gary L; GILLES Bruce A  
**Cc:** SEIDEL Paul  
**Subject:** RE: Regulation of emerging contaminants

Gary –

Thanks for the follow-up discussion last week to clarify DEQ's statutory authority regarding the regulation of perfluorinated compounds (PFAS) as emerging contaminants not currently listed as hazardous substances by DEQ. I agree with your conclusion that it makes sense to consider going before the EQC as soon as is practicable to initiate the listing process. In the meantime, DEQ will continue to support Port of Portland and Department of Defense *investigation* of PFAS on a technical assistance basis, as requested by these parties. The primary focus of this investigation is to determine whether contaminant releases pose a threat to local drinking water resources, including the western portion of the Columbia South Shore Wellfield (City of Portland) located in proximity to both investigation areas.

If you have any additional thoughts, don't hesitate to give me a call.

Dan Hafley

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**From:** VROOMAN Gary L  
**Sent:** Wednesday, January 17, 2018 3:57 PM  
**To:** HAFLEY Dan <Dan.HAFLEY@state.or.us>; GILLES Bruce A <Bruce.A.GILLES@state.or.us>  
**Cc:** SEIDEL Paul <Paul.SEIDEL@state.or.us>  
**Subject:** RE: Regulation of emerging contaminants

I think that if a substance isn't a "hazardous substance" per ORS chapter 465 then those statutes largely don't apply to it until the substance becomes a hazardous substance. That doesn't necessarily mean that DEQ couldn't "informally evaluate" proposals related to substances that aren't hazardous substances but DEQ would have no authority over those substances or their cleanup under ORS chapter 465. That would include no authority to do things like recover remedial action costs associated with informal review (technically the costs would not be remedial action costs). This might not be the case in the context of a cleanup action that does address hazardous substances (like Arkema) because an argument might be made that such analysis a needed part of a remedial action in some way. I think DEQ would want to tread very carefully here. The best course of action is probably to get these things listed if that is warranted and then take action.

Gary Vrooman  
 971.673.1878

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**From:** HAFLEY Dan [<mailto:Dan.HAFLEY@state.or.us>]  
**Sent:** Wednesday, January 17, 2018 3:32 PM  
**To:** GILLES Bruce A; VROOMAN Gary L  
**Cc:** SEIDEL Paul  
**Subject:** RE: Regulation of emerging contaminants



Thanks Bruce. You are correct. The logical follow-up question is whether the absence of a hazardous substance listing in rule/statute precludes regulation by DEQ if it is known to pose a threat to public health and the environment. We had a similar issue with methane a number of years ago, which was informally evaluated at Cleanup sites prior to listing of the compound in rulemaking. Perchlorate is similarly not listed but has certainly been the subject of investigation by DEQ, including at the Arkema site. I believe CERCLA allows for regulation of "hazardous substances" in a broader sense, beyond the listing of individual contaminants.

DH

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**From:** GILLES Bruce A [<mailto:Bruce.A.GILLES@state.or.us>]  
**Sent:** Wednesday, January 17, 2018 3:02 PM  
**To:** VROOMAN Gary L <[Gary.L.VROOMAN@state.or.us](mailto:Gary.L.VROOMAN@state.or.us)>; HAFLEY Dan <[Dan.HAFLEY@state.or.us](mailto:Dan.HAFLEY@state.or.us)>  
**Cc:** GILLES Bruce A <[Bruce.A.GILLES@state.or.us](mailto:Bruce.A.GILLES@state.or.us)>; SEIDEL Paul <[Paul.SEIDEL@state.or.us](mailto:Paul.SEIDEL@state.or.us)>  
**Subject:** RE: Regulation of emerging contaminants

Gary,

The PFOA compounds are not listed hazardous substances. We would have to do rulemaking to be able to enforce cleanup requirements under ORS 465. With that being the case, whatever work is undertaken would have to be done voluntarily, or at least that is my read of the current situation.

I have been holding off on rulemaking until we have an improved understanding of the problem in Oregon and have budget to cover the costs.

Bruce

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**From:** VROOMAN Gary L  
**Sent:** Wednesday, January 17, 2018 2:02 PM  
**To:** HAFLEY Dan <[Dan.HAFLEY@state.or.us](mailto:Dan.HAFLEY@state.or.us)>  
**Cc:** GILLES Bruce A <[Bruce.A.GILLES@state.or.us](mailto:Bruce.A.GILLES@state.or.us)>; SEIDEL Paul <[Paul.SEIDEL@state.or.us](mailto:Paul.SEIDEL@state.or.us)>  
**Subject:** RE: Regulation of emerging contaminants

My first question would be are the "emerging contaminants" in question "hazardous substances" as defined by statute?

Gary Vrooman  
971.673.1878

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**From:** HAFLEY Dan [<mailto:Dan.HAFLEY@state.or.us>]  
**Sent:** Wednesday, January 17, 2018 1:24 PM  
**To:** VROOMAN Gary L  
**Cc:** GILLES Bruce A; SEIDEL Paul  
**Subject:** Regulation of emerging contaminants

Gary –

The Port of Portland is working cooperatively with DEQ Cleanup Program staff to assess the nature and extent of contamination associated with historical fire training activities at Portland International Airport, specifically a class of "emerging contaminants" known as per- and polyfluoroalkyl substances (PFAS). This class of chemicals includes two known to be highly mobile, persistent, and toxic: PFOS and PFOA.

The regulatory framework for these contaminants on a national level is spotty. EPA has issued a drinking water health advisory for PFOS and PFOA, and published Regional Screening Levels (soil) are likewise



available. We are not aware of any EPA-promulgated screening or cleanup standard for either surface water or sediment. A number of states have developed, or are in the process of developing, risk-based standards. To date, DEQ has not. We are using the EPA values for screening purposes, but am not aware of these or other number being applied as cleanup standards within the state.

Based on 2017 sampling, PFAS including PFOA and PFOS have been detected in groundwater, soil, and stormwater at the site, including for the latter at the site outfall to Columbia Slough. The Port is comfortable moving forward with investigation under DEQ using EPA's groundwater and soil values. Before they commit to off-site investigation including within the Slough, they want confirmation that the agency is comfortable, from a regulatory basis, in requesting the work. In part because the work is insurer-funded. At present, we would probably rely on Maine surface water and sediment numbers for *screening*. The intent of site work is to determine the extent of site-related PFAS releases. As noted above, the Port is working cooperatively with DEQ and would like to "get ahead of the issue". There is a lot of momentum at both the state and national level to address these contaminants. DEQ has an informal working group looking at how they might be regulated by DEQ.

Note that there will be an upcoming multi-media PFAS investigation at the Portland Air National Guard Base (located on the PDX property) this year, including surface water and sediment. Investigation is being initiated by DOD, part of a nationwide effort to assess contaminant releases associated with historical fire training and suppression actions at US Air Force bases. Note that they have proposed using EPA's 70 ppt health advisory level for surface water screening.

*Question: do we have solid administrative footing for requesting that they investigate surface water and sediment? I know that there has been discussion of PFAS regulation at past Cleanup PMT meetings, and thus am cc'ing Bruce for his perspective.*

I welcome your input.

Thanks.

Daniel J. Hafley, RG  
Senior Project Manager / Hydrogeologist  
Northwest Region Cleanup Section  
Oregon DEQ



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# Oregon

Kate Brown, Governor

## Department of Environmental Quality

Northwest Region

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Portland, OR 97232

(503) 229-5263

FAX (503) 229-6945

TTY 711

January 4, 2018

Stan Jones  
Port of Portland  
PO Box 3529  
Portland, OR 97208

Re: Investigation Results Report – December 2017  
PDX Fire Training Areas  
ECSI # 3324

Mr. Jones:

DEQ Northwest Region Cleanup Section staff reviewed the report titled *Original and Former Fire Training Facilities, Investigation Results Report, Portland International Airport* prepared by Apex on your behalf and dated December 13, 2017. The report presents the results of ongoing contaminant investigation work at the PIA, with particular focus on the presence of per- and poly-fluoroalkyl substances (PFAS) associated with historical fire-fighting activities. In general, the report does an excellent job of summarizing the results of investigation work. We nevertheless have a number of comments for your consideration.

General, Risk Screening. A robust evaluation of the existing regulatory framework for PFAS is included as Appendix A of the report. Based on this work, screening of contaminant detections in soil, groundwater, surface water, and sediment was completed. We appreciate the effort that has gone into this work, and acknowledge that selected criteria, representing both (non-Oregon) state and federal regulatory guidelines, are presented for contextual purposes at this time. A few comments follow.

- The distinction between “drinking water” values presented in Tables A-1 and A-2, and “groundwater” values presented in Tables A-3 and A-4, is unclear. Please clarify.
- For surface water exposure (Table A-5), the “construction worker” exposure scenario has been selected for risk screening. While this might be appropriate for human exposure within the confines of the (secured) PIA property, we recommend the use of “recreational” values from Maine in screening stormwater discharge to Columbia Slough. Alternately, the “non-drinking surface water” value from Michigan could be considered. Risk screening results should be updated accordingly.
- In Table A-7, EPA RSLs for protection of groundwater should be highlighted for consideration in assessing the potential for contaminant leaching. DEQ notes that these are discussed in report text.



- We recommend inclusion of a table in Appendix that *summarizes* values being used for site-related risk screening, along with the source of the values.
- In early 2017, Air National Guard representatives proposed screening values for upcoming PFAS investigation at the Portland ANG facility, located adjacent to PLA on Port of Portland property. Analysis of screening results should include discussion of these values and how they align with or differ with those for your site. A copy of the email outlined the proposed ANG values is included as an attachment to this letter.

#### Section 2.4.

- We recommend a more details discussion of geology here, relying on Section 3.2.2 of the 2012 *Land and Beneficial Water Use Survey Update* prepared by Ash Creek Associates for the Port. As noted in the report, sand-dominated deposits comprising the CRSA represent a paleo-channel of the nearby Columbia River. During emplacement, scouring of older, underlying TGA and CU1 strata occurred. The CRSA represents a distinct hydrostratigraphic unit. Outside of CRSA occurrence, coarser-grained deposits of the Unconsolidated Gravel Aquifer/upper Troutdale Gravel Aquifer commonly underlie shallow Overbank Deposits, and can be as little as 40 feet below ground surface. Cross sectional diagrams presented in the above-cited report suggest that the investigation area is fully underlain by the CRSA, although the depth at which it is encountered (below Overbank Deposits), and the total thickness of the unit, are variable from point-to-point.
- Text indicates that the CRSA is used as drinking water source. Please indicate whether this is referencing domestic or municipal use, as we are not aware of any current use of the CRSA (or TGA) by the City of Portland.
- We recommend inclusion of information in the report identifying all wells located within one mile of the facility. Alternatively, a focused beneficial water use determination might be completed and submitted separately.
- Please include discussion of the QTA well in reference to local groundwater use. Here and in Section 3.2.8, please identify the non-potable use that is contemplated (car washing?) for the well.

Section 2.5. Please see our comment above regarding inclusion of a “recreational” user screening value for surface water (or groundwater) that might discharge to Columbia Slough. Also, while we understand that wildlife are discouraged from site use, some exposure to terrestrial ecological receptors could occur. Please consider.

Section 3.2.4. We understand that adding water during drilling was necessary to prevent/minimize sand heaving, but note that equal amounts of water were added and subsequently withdrawn (45 gallons). DEQ would typically recommend removing significantly *more* water than added to confirm removal of all added water and the representativeness of subsequent sampling effort.

Section 3.2.8. Text indicates that well construction occurred over a period of approximately four months. Please clarify. Regarding sample collection at the “wellhead”, please identify the type of well pump that has been installed in the well (permanently, we assume). The sampling results are informative but not, by themselves, definitive in terms of ruling out impacts to water wells/users to the east.



Section 4.1. What is the nature of the “waxy yellow buildup” observed during the sewer survey? Might it be contaminant-related, or instead represent mineral staining associated with groundwater seepage into the sewer.

Section 4.3. The “new” observance of NAPL in MW-12 is interesting. Please discuss whether the observation of petroleum product at this location is consistent with the contaminant release model.

Section 4.4.1 (and Executive Summary). Based on DEQ contouring of groundwater data for PFOA and PFOS, horizontal contaminant delineation is incomplete to both the northeast (see location B-X-GW) and west/southwest. We expect the next phase of site work to include installation of permanent wells for more reliable (and longer-term) groundwater monitoring.

Section 4.4.5. More interpretation of TOP Assay results would be helpful, including use of analytical data to support the conclusion that detected PFAS compounds are unlikely to “weather to substances of concern such as PFOA.”

Section 4.6. DEQ notes that the laboratory reporting limit (2,050 ng/kg) exceeds the recreational sediment screening level (Maine) presented in Table A-9. Please discuss whether this was the lowest detection limit that could be achieved.

Section 5.0. Please see comments above.

Figures 4 and 7. The legend for these figures notes highlighting of EPA health advisory concentrations for drinking water, but non-EPA, media-specific risk-based screening levels are also provided in the figures. It is unclear which “screening criteria” are being applied in highlighting.

Tables. We recommend adding a table to the report identifying the screened intervals for sampled groundwater wells, and the sampling (temporary well screen) interval for one-time groundwater samples.

Appendix A. See general comment above. Also, the appendix is titled “Survey of PFOS Screening Values”. We believe it should instead be titled “Survey of PFAS Screening Values”.

Appendix D. DEQ notes that there were a number of minor problems identified in the QA/QC analysis, perhaps the most notable being exceedance of sample holding times for multiple samples for PFAS analysis, and LCS/LCSD recoveries outside of control limits. The data nevertheless seem to be acceptable for screening purposes.

I can be reached at 503-229-5417 if you have any questions.